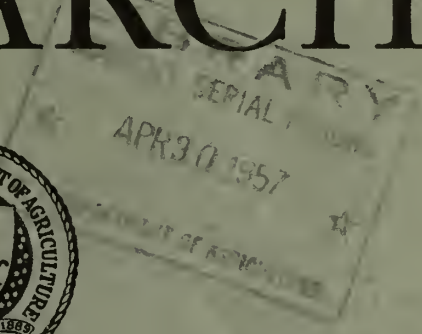


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Agricultural Economics RESEARCH



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UNITED STATES DEPARTMENT OF AGRICULTURE

• Agricultural Marketing Service
Agricultural Research Service

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Some Effects of Suburban Residential Development on Local Finances

By Frederick D. Stocker

Recent population trends have transformed many rural farming communities into residential suburbs. The changing pattern of land use has had important effects on farm land values and on farm property taxes. It has also placed a strain on the financial resources of local government. Especially where local units are small and lack economic diversification, problems of supplying necessary governmental services to a growing population may become severe. This study examines the financial problems brought on by the process of suburbanization in four school districts of Wisconsin. The situation described is similar to that found in the school districts of many other areas where development of suburbs has been rapid and where financial resources are restricted by the small size of local governmental units. In some States, school district consolidation offers a partial solution to the problems such communities face. Other measures to be considered include more effective land use planning and zoning laws, improved property tax administration, possible use of nonproperty forms of local taxation, and perhaps an altered division of financial responsibility between States and their local subdivisions for school financing. The author acknowledges the contribution of Arthur J. Walrath, of the Farm Economics Research Division, ARS, who supplied, or helped in the collection of, most of the data used in this study, and who gave many valuable comments on an earlier draft of the report.

DURING THE MONTH OF DECEMBER 1954, the first homes were completed in a new residential subdivision on the suburban fringe of Milwaukee, Wis. Throughout the development there were to be in all between 400 and 500 houses. Those that had been completed were neat and attractive, though inexpensive; most sold for less than \$10,000. The lots on which they were situated were of fair size and held promise of green lawns, gardens, and shrubbery, but in December the ground was bare and muddy. The curving streets of the subdivision were as yet unpaved and consisted only of graded dirt fill. Gutters and storm sewers remained to be built.

By the first of the year, about 100 homes were occupied, and families began to settle into the

routine of daily living in their new community. As part of this process, parents made ready to send their children back to school following the Christmas recess. Apparently not until that moment did many of the residents realize that there was no public school in the district into which they had moved.

This absence of public schools stemmed from a combination of circumstances. Until several months earlier, the area had been farmland. As very few public services had been required, local government existed only in rudimentary form. Besides those services performed by the county government, the town¹ had supplied a modicum

¹ In Wisconsin, as in New England, the town is a rural unit roughly comparable to the township in other States.

of roads, police protection, and the like. As for public education, the area had been part of a rural district that operated a one-room elementary school.

The coming of suburban residential development had a heavy impact on this rural community. The town government found itself inadequate to the task of supplying municipal services in the urbanized area that had suddenly come into being. Construction of streets and gutters and erection of street lights were among the tasks that had to be postponed.

Perhaps most difficult of all was the school situation. This was complicated by the separation of the existing school district into two parts. One embraced the rural portions outside the subdivision and included the area in which the one-room school building was situated. The remaining area comprised the site of the new subdivision, and covered less than a square mile. So it happened that families, when they moved into this area, found it not only without schools, but without even the organizational structure for supplying this essential service.

At first, it appeared to the children of the area that they were in the utopian situation of being exempt from the necessity of attending school. But pressure from the State Department of Public Instruction, and an emergency grant of funds from the State, soon enabled the community to open school on a makeshift basis under the auspices of a citizens' school committee. An unoccupied home served as a school building for the rest of the school year, and classes were held in two shifts.

Formal organization of a school district and election of officers took place in the summer, but it was not until the summer of 1956 that plans were begun for permanent school facilities. At the start of the 1955-56 school year, three houses were put into use, with a fourth held in reserve. These temporary facilities were still in use at the beginning of the 1956-57 school year.

Purpose and Plan of Study

Although the situation just described may be unusual, it is an outgrowth of circumstances that are common. Throughout the United States, recent years have brought a steady movement of population from urban centers into the less thickly

peopled suburban fringe and the rural areas that lie beyond. This migration into regions that until recently have been only sparsely settled has forced many local units to adapt their governmental operations almost overnight to a radically changed situation.

The purpose of this study is to identify some of the problems in local government encountered when a rural community becomes a residential suburb. Our principal concern is with the impact of suburban residential development as reflected in the finances of local units. Less attention is given to the necessary social, political, and administrative adjustments, even though these may also give rise to important and difficult problems.

The discussion that follows is based on a detailed examination of population growth and governmental finances in four local school districts in one Wisconsin county. It is therefore a form of case study. This approach offers several advantages over an analysis of global statistics in studying local finance. Most statistical data on local governments are available only in highly aggregated form. Thus they obscure the situation of the rapidly growing suburban area in a mass of data that covers growing, stable, and declining localities. Suburban residential development, in contrast, is inherently a localized phenomenon that, like lightning, strikes one neighborhood but leaves others nearby untouched.

Moreover, because of the localized nature of suburbanization, it is desirable in examining the process to concentrate attention on the smaller units of local government. The choice of a school district as the appropriate unit in which to observe the effects of residential growth was based largely on the fact that the school district is geographically one of the smallest units of local government. In Wisconsin, the school district is considerably smaller than the county, and smaller even than the town. Its typical size is perhaps 5 or 6 square miles. As a result, the finances of school districts reveal the effects of suburbanization in more pronounced form than do those of larger local units.

A further reason for concentrating attention on the individual local unit is that in most States local governments are given the principal responsibility for dealing with problems caused by movements of population. Within fairly general limitations established by State law, local school dis-

tricts must decide for themselves such matters as whether to construct a new school building or to expand one already standing, how to finance school expansion, and what tax rate to levy. At present, local units in Wisconsin have a great degree of autonomy. As a result, unless and until a larger share of responsibility for such governmental activities as the public schools passes to the State, or perhaps to the Federal Government, measures to cope with problems associated with an expanding population must originate in the local district.

A study of school-district finances is, of course, only part of the larger problem of obtaining a picture of the full range of local government activities as they are affected by population shifts. School districts are concerned only with supplying public education. But other governmental activities such as providing roads, public welfare, and police protection are also influenced by suburban growth.

On the other hand, special attention to schools is warranted by their great fiscal importance. For the nation as a whole, public schools account for more than 40 percent of direct general expenditures of all local governments, and in terms of cost they far overshadow any other function of local government. Moreover, because of the public demand for schools, the educational system may be expected to show the effects of shifting population in their most severe forms.

To a greater extent than is true of other public services, the need for some kind of school system is imperative. The paving of streets in a new development can be postponed for a few years, and sometimes is; police and fire protection may remain inadequate long after an influx of population has taken place; but State laws ordinarily specify that schools must be provided, and they generally go further to set certain minimum standards. As a result, schools rank first on the public agenda in any rapidly growing community. For this reason, they illustrate particularly well the effects of residential development.

Agriculture in Waukesha County

The four school districts selected for study are part of the suburban fringe area of Milwaukee, Wis. They lie in Waukesha County, which borders Milwaukee on the west. The seat of county

government is in the City of Waukesha, which in 1950 had a population of just over 20,000. It is situated near the center of the county, about 15 miles from downtown Milwaukee. All 4 of the districts are close to the City of Waukesha, but their economic ties are primarily with Milwaukee, which in 1950 had about 637,000 inhabitants. Non-agricultural workers living in the 4 districts are employed almost entirely in Milwaukee.

Waukesha County is an established agricultural area, in which dairy farming predominates. The number of farms has decreased in recent years, from 3,049 in 1949 to 2,669 in 1954. During this period, the acreage in farms declined about 5 percent. At the same time, the average size of farm increased from 97.6 to 105.5 acres. Much of the land that went out of farming was developed as residential property, but there has been no increase in the number of part-time or residential farms. The combined total of these types of farms dropped from 700 in 1950 to 650 in 1954. These facts suggest what is borne out by observation, that purchasers of suburban property in this region typically have not engaged in farming as a sideline.

Population Growth and Schools in Waukesha County

Population has increased rapidly in Waukesha County, particularly in the suburban area. In 1940, the population stood at 62,744, of which slightly more than a third was classified as rural nonfarm (table 1). A decade later, total population had grown by 36.9 percent, or to 85,901. The increase in urban population during this period was 11.7 percent, but rural nonfarm population more than doubled. At the same time, the number living on farms decreased by a fifth, or to 13,486.

TABLE 1.—*Urban, rural farm, and rural nonfarm population, Waukesha County, Wisconsin, 1940 and 1950*¹

	1940	1950	Percentage change
Total.....	62, 744	85, 901	+36. 9
Urban.....	23, 804	26, 578	+11. 7
Rural nonfarm.....	22, 244	45, 837	+106. 1
Rural farm.....	16, 696	13, 486	-19. 2

¹ Source: U. S. Bureau of the Census. For purposes of comparison, the old urban definition was used.

The net result of these changes was that more than half the population was classified as rural nonfarm in 1950.

The growth of population is revealed also in county statistics on the school census, school enrollment, and number of births (table 2). Since 1944, school enrollment has almost doubled, and the school census, taken annually by the school districts, has shown an expansion of more than 150 percent among children aged 4 through 19. The steady increase in the number of births promises still further rises in school population. The following statistics on enrollment for September 1954 indicate the extent to which children of school age are concentrated in the lower grades:

Grade:	Number of pupils
1-----	1,514
2-----	1,605
3-----	1,373
4-----	1,228
5-----	1,216
6-----	1,293
7-----	1,121
8-----	953

These figures represent the entire county. Some individual districts have not shared in the general increase in population and school enrollment, and may not show the same concentration in lower grades. Others, however, have experienced proportionate increases and a degree of concentration far greater than those indicated by the county figures.

TABLE 2.—*Number of births, population aged 4-19 years, and school enrollment, Waukesha County, 1944-55*¹

Year	Number of births	School census (ages 4 through 19)	School enrollment
1944-----	1,383	10,781	6,613
1945-----	1,416	10,727	7,182
1946-----	1,730	11,226	7,178
1947-----	1,891	11,953	7,636
1948-----	1,880	12,686	7,364
1949-----	1,983	13,796	8,565
1950-----	2,103	14,766	8,895
1951-----	2,264	16,109	9,350
1952-----	2,319	17,476	10,314
1953-----	2,447	19,323	11,537
1954-----	2,622	27,833	12,599
1955-----		30,753	14,182

¹ Source: Annual Report, Waukesha County Schools November 1955, p. 7.

In 1952, in all of Wisconsin there were 5,298 school districts, of which 82 were classified as city school systems.² Thus, on the average, there were about 76 school districts per county, excluding Milwaukee. In the Waukesha County school system during the school year 1954-55, there were 105 school districts, 6 of which were high school districts. The rest, including 38 one-room rural school districts, were distributed over the rural parts of the county, an area of between 500 and 575 square miles. School districts therefore typically cover between 5 and 6 square miles. In this respect, the 4 districts studied are about average for the county.

School District "A"

The most urbanized of the 4 areas, which may be referred to as District "A," is centered about 8 miles east of the City of Waukesha, astride a highway to Milwaukee. Since subdivision began in the years immediately before World War II, the growth of District A has been steady, and the area is now almost entirely residential. The increase in number of homes has been accompanied by some commercial development—a few stores and a gas station or two along the highway within the boundaries of the district. Full-time commercial farming has virtually disappeared, however, and there is no industrial or public-utility property to speak of in the district.

Table 3 shows the number and assessed value of various categories of improved and unimproved properties in District A. The transformation of this area over a period of 15 years from farmland to a residential suburb is reflected in the rapid increase in the number of improved properties of smaller size. Between 1939 and 1954, the number of improved properties having less than 10 acres increased threefold, while the number of improved lots in recorded subdivisions increased 20 times. The growth in assessed valuation in these categories amounted to 1,400 and 7,000 percent, respectively, while the proportion of assessed valuation attributable to properties having 10 acres or more declined from 41 percent of the total in 1939 to only 7.5 percent in 1954.³

² LOCAL GOVERNMENT STRUCTURE IN THE UNITED STATES. Bureau of the Census. State and Local Government Special Studies No. 34. 1954. pp. 83-4.

³ In this district, as in each of the others, the increase in assessed valuation between 1949 and 1954 is partly a result of a reassessment of property.

TABLE 3.—*Number and assessed value of properties in District A, 1939-54*

	Number of units				Assessed value (Thousand dollars)			
	1939	1944	1949	1954	1939	1944	1949	1954
10 acres or more:								
Without improvements.....	13	15	13	8	21. 2	29. 8	21. 4	22. 8
With improvements.....	26	24	27	31	140. 8	106. 9	127. 0	359. 4
Total.....	39	39	40	39	162. 0	136. 7	148. 4	382. 2
Less than 10 acres:								
Without improvements.....	12	13	33	29	4. 7	6. 1	11. 6	16. 4
With improvements.....	33	48	71	135	71. 2	115. 2	167. 8	1, 084. 6
Total.....	45	61	104	164	75. 9	121. 3	179. 4	1, 101. 0
Lots in recorded subdivisions:								
Without improvements.....	1, 127	1, 045	1, 074	777	109. 8	108. 6	148. 4	105. 8
With improvements.....	22	195	273	449	50. 8	449. 5	687. 8	3, 535. 9
Total.....	1, 149	1, 240	1, 347	1, 226	160. 6	558. 1	836. 2	3, 641. 7

In 1942, daily attendance at the elementary school in District A averaged 64 pupils. School was held in 2 one-room buildings located side by side at a crossroad near the center of the district. In 1948, average attendance having grown to more than 100, a new building was constructed in a residential section several blocks from the old school. Constant pressure of population, however, rendered the new facilities inadequate almost before they were completed. Attendance has increased steadily since 1948, and new classrooms have been added to the building almost every year.

This continuous program of expansion has resulted in elementary school facilities that are attractive in design and modern in all respects, but it has brought comparatively heavy school taxes. In recent years, local tax collections have averaged more than \$10 per \$1,000 of equalized assessed value (table 4). In part, these taxes have been necessitated by a low ratio of equalized valuation to the number of pupils in average daily attendance. The low ratio in turn is attributable to the predominance of residential over commercial, industrial, and farm property within the district. A study of this ratio in the 63 multiple-

TABLE 4.—*Summary of finances of school district A, 1944-55*

	Equal- ized value	Inter- gov- ern- mental revenue	Local taxes collected	Local general revenue	Total general expendi- tures	Unpaid debt, June 30	Local tax collections per \$1,000 equalized value	General expenditure per pupil in average daily attendance	Equalized value per pupil in average daily attendance ¹
	<i>1,000 dollars</i>	<i>Dollars</i>	<i>Dollars</i>	<i>Dollars</i>	<i>Dollars</i>	<i>Dollars</i>	<i>Dollars</i>	<i>Dollars</i>	<i>Dollars</i>
1944.....	1, 372	1, 013	5, 031	6, 244	5, 962	-----	4. 20	66	13, 311
1945.....	1, 483	1, 536	9, 009	10, 870	6, 728	-----	6. 57	62	12, 587
1946.....	1, 638	1, 800	9, 003	10, 843	8, 441	-----	6. 07	100	17, 655
1947.....	1, 884	1, 792	16, 002	18, 920	13, 054	-----	9. 77	147	18, 404
1948.....	2, 429	1, 678	32, 002	33, 901	16, 682	44, 500	16. 99	162	18, 291
1949.....	3, 180	1, 322	35, 638	37, 898	25, 860	54, 877	14. 67	167	15, 671
1950.....	3, 901	5, 850	34, 006	43, 295	33, 403	39, 797	10. 69	191	18, 171
1951.....	5, 174	6, 825	49, 008	60, 952	42, 076	55, 856	12. 56	180	16, 671
1952.....	6, 266	10, 213	45, 528	62, 442	52, 072	141, 539	8. 80	204	20, 290
1953.....	7, 447	10, 691	60, 158	73, 931	65, 254	133, 780	9. 60	232	22, 299
1954.....	7, 958	10, 782	85, 106	91, 620	77, 656	197, 180	11. 43	238	22, 844
1955.....	-----	14, 743	90, 003	109, 986	90, 417	188, 262	11. 31	215	18, 926

¹ Calculated on basis of previous year's assessment.

room elementary schools in Waukesha County reveals that, in 1955, District A was fourth from the lowest, with an equalized assessed value of \$18,926 per pupil in average daily attendance. The corresponding figure for the median district was \$30,238.

When account is taken of the rise in the general price level, it is evident that equalized assessed valuation per pupil in average daily attendance was actually lower in 1955 than it was 12 years earlier. Average valuation in 1955 was 42 percent greater than that of 1943, but the increase in prices as measured by the wholesale price index for all nonagricultural commodities amounted to 65 percent.

Besides relatively heavy property taxes for school purposes, considerable borrowing has been resorted to for expansion of school facilities in District A. At the close of the 1955 fiscal year, the district carried a debt of \$188,000, or 2.4 percent of the equalized assessed value. Eight years earlier it had no debt. During the same period, capital outlays amounted to more than \$300,000.

In summary, District A may be pictured as an area of rapid and extensive residential growth, but one in which there has been a vigorous effort on the part of residents to keep school facilities abreast of the demand. That this effort has been successful is evidenced by the fact that the elementary school in District A is reported to be among the best in Waukesha County. Because of its limited assessment base, however, and more particularly because of the virtual absence of nonresidential property from the tax rolls, the district has been able to supply good schooling only by imposing heavy tax rates and relying extensively on borrowing.

School District "B"

District B lies immediately to the west of District A and is adjacent to the City of Waukesha. Until recently, residential growth in this area has been slow. For the most part, it has taken the form of an increase in the number of homes built on roadside tracts carved from farm properties, the rest of which, in most instances, was still under cultivation in 1955. In that year, several dozen full-time farms remained in operation within the district.

In the last few years, however, the pace of residential building has accelerated. From 1941

to 1950, the school census showed an increase of only 25 percent in the number of children from 4 to 19 years old, but since 1950 the number in that age group has more than doubled. Moreover, the existence of several large tracts suitable for subdivision into building lots suggests that the greatest spurt of residential development is yet to come.

As of 1954, lots in recorded subdivisions accounted for a far smaller proportion of assessed valuations in District B than in District A (table 5). Such lots represented 13 percent of the 1954 tax base in B, as compared with 71 percent in A. Five years earlier, in 1949, only 2 percent of the value of property on the tax rolls in District B was composed of lots (improved or unimproved) in recorded subdivisions. On the other hand, properties not in recorded subdivisions and having less than 10 acres are of greater proportional importance in B than in A. In 1954, such properties accounted for 61 percent of total assessed valuations in District B, compared with 21 percent in the neighboring jurisdiction.

The property tax base in District B is more diversified than that of District A. Whereas A is almost entirely residential, B has a scattering of full-time farms and some industrial and commercial property. Among the latter are a commercial greenhouse, a small factory that produces church furniture, at least one gas station, and three small plants that manufacture cement blocks. Neither district has any sizable amount of public utility property on its tax rolls.

Average daily attendance at the elementary school in District B changed very little between 1941 and 1952. Since 1952, however, the trend has been steadily upward. The number of teachers remained constant at two from 1941 to 1950. In the school years ended in 1951 and 1952, a third person was employed on a half-time basis. Three full-time teachers were employed in 1953 and 1954, and another was added in 1955. A one-room schoolhouse supplemented by a temporary barracks-type building sufficed until the 1951-52 school year, and in 1952 a new four-room school was built.

Construction of the new school building was financed by a loan of \$80,000 (table 6). By the close of the 1955 fiscal year, the debt outstanding had been reduced to \$60,000. In 1955, property

TABLE 5.—*Number and assessed value of properties in District B, 1939-54*

	Number of units				Assessed value (thousand dollars)			
	1939	1944	1949	1954	1939	1944	1949	1954
10 acres or more:								
Without improvements.....	7	6	7	6	27.4	29.1	29.7	33.3
With improvements.....	27	28	24	28	177.7	178.1	178.6	470.9
Total.....	34	34	31	34	205.1	207.2	208.3	504.2
Less than 10 acres:								
Without improvements.....	21	20	28	34	4.2	4.3	6.8	15.3
With improvements.....	67	80	99	144	209.5	262.9	386.1	1,190.7
Total.....	88	100	127	178	213.7	267.2	392.9	1,206.0
Lots in recorded subdivisions:								
Without improvements.....	25	58	56	91	1.3	4.5	4.3	31.0
With improvements.....	5	5	7	40	4.5	4.4	9.0	234.4
Total.....	30	63	63	131	5.8	8.9	13.3	265.4

taxes for school purposes amounted to \$6.59 per \$1,000 of equalized assessed value compared with \$5.06 in 1950. In 1955, a ranking of districts according to their ability to pay for public education, as measured by the equalized valuation per pupil in average daily attendance, put District B 17th among the 63 districts. Its average equalized valuation was \$38,154, compared with \$30,238 for the median district.

To judge from appearances, the elementary school operated by District B is far less elaborate than that of District A. In size, style, and quality of construction, the building in the latter appears to be superior to that of the former. Moreover, District A probably enjoys a better-rounded aca-

demic program and more extracurricular activities. These are usually characteristic of a more populous community and larger scale operation.

District B, however, carries a smaller financial burden. In relation to equalized valuations, local taxes for school purposes have been well below those of District A. Debt, too, was less in District B, where it represented only 1.6 percent of equalized assessment valuations in 1955, compared with 2.4 percent in District A. The lower financial burden in District B may be attributed largely to the fact that within its borders there is a moderate amount of nonresidential property to contribute to the support of public schools.

TABLE 6.—*Summary of finances of School District B, 1941 and 1950-55*

	Equal- ized value	Inter- govern- mental revenue	Local taxes col- lected	Local general revenue	Total general expen- ditures	Unpaid debt, June 30	Local tax collections per \$1,000 equalized value	General expendi- ture per pupil in average daily at- tendance	Equalized value per pupil in average daily at- tendance ¹
	1,000 dollars (²)	Dollars	Dollars	Dollars	Dollars	Dollars	Dollars (²)	Dollars	Dollars (²)
1941.....	(²)	1,040	2,500	3,737	3,287	-----	(²)	68	(²)
1950.....	2,106	1,950	8,399	11,573	9,482	-----	5.06	153	26,758
1951.....	2,602	1,950	12,702	17,036	12,142	-----	6.03	202	43,366
1952.....	3,008	1,869	15,438	21,333	13,720	80,000	5.93	233	44,102
1953.....	3,304	2,606	16,510	26,624	18,653	72,000	5.49	259	41,778
1954.....	3,706	2,736	19,225	24,173	17,811	68,000	5.82	220	40,790
1955.....	-----	1,164	24,437	27,642	23,977	60,000	6.59	247	38,154

¹ Calculated on basis on previous year's assessment.

² Not available.

TABLE 7.—*Number and assessed value of properties in District C, 1939-54*

	Number of units				Assessed value (Thousand dollars)			
	1939	1944	1949	1954	1939	1944	1949	1954
10 acres or more:								
Without improvements.....	6	4	5	5	13.5	4.6	4.3	10.3
With improvements.....	17	16	18	20	138.2	135.4	136.0	445.6
Total.....	23	20	23	25	151.7	140.0	140.3	455.9
Less than 10 acres:								
Without improvements.....	6	8	17	20	1.5	2.8	3.5	5.2
With improvements.....	3	14	24	39	7.6	19.8	35.7	356.9
Total.....	9	22	41	59	9.1	22.6	39.2	362.1
Lots in recorded subdivision:								
Without improvements.....	0	49	106	85	0	5.8	16.9	57.2
With improvements.....	0	13	24	46	0	37.9	50.6	566.4
Total.....	0	62	130	131	0	43.7	67.5	623.6

School District C

Northwest of the City of Waukesha, and centered about 5 miles from the corporate limits, lies School District C. Although it is on the far side of Waukesha from Milwaukee, quick and easy access to the metropolitan area is provided by a through highway that bypasses the urban area of Waukesha. By 1955, this highway was bordered by rural residences throughout its length in the district. There are three subdivisions with a total of about 130 lots. The homes, unlike those in many other residential developments, are not of uniform construction and style, but have been built to order, one or two at a time, over a period of a decade or more.

Residential growth throughout this district, as in District A, dates from the days immediately before World War II. There has been a fairly steady rise since 1939 in the number of improved properties having less than 10 acres and in lots with improvements (table 7). Unlike A, but similar to B, District C continues to have a number of fulltime farms still in operation. Thus, despite the fact that commercial, industrial, and utility property is virtually nonexistent within the district, the tax base includes some property other than private residences.

To judge from equalized assessed valuations, improved properties in the subdivided area of District C are more valuable on the average than those of either A or B. In 1954, the average equalized valuation of such properties in District C amounted to \$14,480, compared with \$12,143

in A, and only \$9,710 in B. Unimproved lots in recorded subdivisions had an average equalized valuation of \$792 in C, as compared with \$210 in A, and \$565 in B.

In District C, suburban development has brought almost a doubling in 12 years in the ratio of local tax collections to equalized assessed values (table 8). Still, the ratio is not as high as that found in District A, although it is slightly greater than the ratio of B.

In its ability to pay for public education, as measured by the relation of equalized valuations to average daily attendance, District C ranks above A, but below B, and well below the median of \$30,238. With an average equalized valuation of \$25,603 in 1955, it placed 43rd among the 63 multiple-room elementary schools in the county.

The elementary school operated by District C occupies a modern two-room building that was constructed in 1953. The building is so designed that additional classrooms can be added to the basic unit as the need arises. In 1955, daily attendance averaged 71. This was an increase of 16 students over the average number in attendance the year before, and it was more than double that of 1949, when one teacher taught 32 students in a one-room building.

In constructing its new elementary school, District C went into debt by about \$55,000. Since 1953, additional debt has been incurred. At the close of fiscal 1955, debt outstanding amounted to 2.8 percent of the equalized assessed value, a proportion greater than that of either District A or B.

Since construction of the new building in 1953, school facilities in District C have been adequate and modern. Population growth has proceeded comparatively slowly, and the district has experienced no particular difficulty in keeping abreast of school needs. But it is unlikely that the rate of growth will slacken in the years immediately ahead; indeed, it may accelerate. Many unimproved lots remain in subdivisions already laid out. And there remains much land still in agricultural use that is clearly suitable for residential development. Expanded school facilities will almost certainly be needed, and in turn they will necessitate further borrowing. As a result, the future appears likely to bring not only a larger population but also heavier debt and higher tax rates to the inhabitants of District C.

School District D

The most rural of the districts studied lies west of Waukesha, its center about 3 miles from the city limits. No direct and convenient route provides access to Milwaukee. Commuters who live in District D and are employed in Milwaukee apparently must drive through Waukesha to get to work. Therefore, residential development thus far has been slow.

Except for a few rural residences bordering the highway, the district consists largely of active farms. The number of properties having 10 acres

or more has remained almost constant over the last 15 years (table 9). A steady increase, however, has occurred in the number of improved properties having less than 10 acres. These include, for the most part, tracts of a few acres each that have been sold as residential lots from the edges of farms. Even more striking than the increase in numbers is the growth in assessed valuation of properties having less than 10 acres.⁴ These constituted less than 4 percent of the total valuation in the district in 1939. In 1944, this proportion stood at 7 percent, and by 1949 it had grown to 11 percent. In 1954, 30 percent of the assessed valuation of the district consisted of properties having 10 acres or less. No subdivision had occurred before 1954.

When the 33 one-room elementary schools of Waukesha County were ranked according to their ratios of equalized assessed valuation to average daily attendance in 1955, District D stood 21st. Despite this low position, however, its average valuation amounted to \$33,124 (table 10)—a figure larger than that of Districts A and C, and above the median for all districts operating multiple-room elementary schools.

⁴ This increase may be attributed partly to a reassessment of property, which increased the valuation placed on properties in the less-than-10-acres category more than that of other properties.

TABLE 8.—*Summary of finances of School District C, 1943-55*

Year	Equal- ized value	Inter- govern- mental revenue	Local taxes col- lected	Local general revenue	Total general expendi- ture	Unpaid debt, June 30	Local tax collections per \$1,000 equalized value	General ex- penditure per pupil in average daily at- tendance	Equalized value per pupil in average daily at- tendance ¹
	<i>1,000 dollars</i>	<i>Dollars</i>	<i>Dollars</i>	<i>Dollars</i>	<i>Dollars</i>	<i>Dollars</i>	<i>Dollars</i>	<i>Dollars</i>	<i>Dollars</i>
1943.....	312	518	1, 477	2, 045	1, 881	-----	4. 89	125	20, 133
1944.....	376	507	1, 392	1, 899	1, 737	-----	4. 46	116	20, 800
1947.....	465	500	3, 288	3, 907	2, 402	-----	7. 37	109	20, 273
1948.....	618	500	3, 000	3, 502	2, 702	-----	6. 45	93	16, 034
1949.....	737	500	4, 295	4, 796	3, 990	-----	6. 95	125	19, 313
1950.....	898	975	5, 050	6, 030	3, 934	-----	6. 85	98	18, 425
1951.....	1, 268	975	5, 916	6, 916	5, 249	-----	6. 59	122	20, 833
1952.....	1, 406	1, 705	6, 507	8, 312	5, 572	-----	5. 13	133	30, 190
1953.....	1, 659	1, 820	12, 256	18, 334	10, 097	55, 730	8. 71	198	27, 569
1954.....	1, 806	1, 871	13, 450	15, 383	10, 515	52, 617	8. 11	191	30, 164
1955.....	-----	2, 107	15, 442	18, 151	13, 803	50, 117	8. 55	194	25, 603

¹ Calculated on basis of previous year's assessment.

TABLE 9.—*Number and assessed value of properties in District D, 1939-54*

	Number of units				Assessed value (Thousand dollars)			
	1939	1944	1949	1954	1939	1944	1949	1954
10 acres or more:								
Without improvements.....	3	3	2	5	13.2	4.8	4.8	16.8
With improvements.....	16	16	16	16	139.8	145.6	141.1	292.4
Total.....	19	19	18	21	153.0	150.4	145.9	309.2
Less than 10 acres:								
Without improvements.....	0	1	3	0	0	0.1	0.6	0
With improvements.....	5	7	10	14	6.0	10.7	17.1	134.8
Total.....	5	8	13	14	6.0	10.8	17.1	138.8
Lots in recorded subdivisions:								
Without improvements.....	0	0	0	0	0	0	0	0
With improvements.....	0	0	0	0	0	0	0	0
Total.....								

District D appears now to be in about the same stage of development that was attained a decade ago by District C, and perhaps 15 years ago by District A. The sale in 1955 of a large property for subdivision suggests that District D stands on the threshold of a sizable increase in population. The one-room school that is now adequate for 21 students can perhaps accommodate a dozen more. A larger increase than this probably would cause the district to rely on some temporary makeshift, such as a quonset hut or a barracks-type building. This is an expedient that often is used in rapidly growing areas. But it appears evident that within a few years the one-room school in District D will have to be replaced with a larger permanent structure.

Effects of Suburbanization on Local Finance

The experience of the four school districts illustrates several effects of population growth. Upward pressure on taxes is evident in all these local governments, except in District D, where no great population increase has yet occurred. Local taxes, as a proportion of equalized assessed value, have risen highest in District A, where suburbanization has been most extensive.

District B, where more commercial and industrial properties and some farmland are found, had a greater equalized assessed valuation per pupil in average daily attendance in 1955 than any of the other three districts studied. Also local taxes in District B remained relatively low, despite the rapid increase in population since 1950.

District C contains a number of farm properties, but practically no business properties of any

other kind. It has experienced a steady growth in population, but the pace has been slower than in District A. Local taxes, in relation to equalized valuations, were lower in 1955 in District C than in A, but greater than in either of the other two areas.

Debt

Local governmental debt also shows a tendency to increase in districts where new facilities are required to accommodate a growing school population. None of the four districts was in debt in the days before residential development began, but in 1955 District D alone remained debt free. Of the other three, District A ranked lowest in debt per pupil in average daily attendance, with \$448 in 1955. District B had, in contrast, \$619, and C, \$706. As a proportion of equalized valuations, however, B ranked lowest with 1.6 percent, compared with 2.4 percent in A. By this measure also, District C ranks highest, showing a debt ratio of 2.8 percent.

But the significance of the amount of local debt should not be exaggerated. To be sure, it imposes a fixed charge in the form of interest charges and payments on principal. But few would argue that a program of capital expansion in a governmental unit as small as a school district could, or even should, be financed on a pay-as-you-go basis. The cost of constructing a new school building is properly regarded as a charge not only against present taxpayers, but also against those who in future years may move to the district and benefit from the use of the schools.

TABLE 10.—*Summary of finances of School District D, 1944-55*

Year	Equalized value	Inter-governmental revenue	Local taxes collected	Local general revenue	Total general expenditure	Local tax collections per \$1,000 equalized value	General expenditure per pupil in average daily attendance	Equalized value per pupil in average daily attendance ¹
	<i>1,000 dollars</i>	<i>Dollars</i>	<i>Dollars</i>	<i>Dollars</i>	<i>Dollars</i>	<i>Dollars</i>	<i>Dollars</i>	<i>Dollars</i>
1944	301	256	994	1, 266	1, 289	3. 90	322	63, 750
1949	487	430	2, 725	3, 175	3, 569	6. 08	400	50, 000
1950	585	625	3, 215	4, 328	3, 313	6. 60	370	54, 000
1951	619	600	4, 051	4, 651	3, 650	6. 92	400	65, 000
1952	644	513	3, 001	3, 561	3, 004	4. 85	334	68, 778
1953	684	586	3, 003	3, 590	2, 773	4. 66	198	46, 000
1954	697	678	3, 501	4, 183	4, 709	5. 12	294	42, 750
1955		772	4, 003	4, 776	3, 822	5. 74	182	33, 124

¹ Calculated on basis of previous year's assessment.

More than the burden of carrying debt, an aspect of school-district borrowing that deserves attention concerns the procedural decisions that must be made in borrowing. These may easily be more troublesome than the financial problem of servicing and repaying debt. Before a district can borrow money, many technical matters must be settled. For example, the legal aspects of borrowing must be examined, including any debt limit to which the district is subject. Terms of the loan and the repayment schedule must be decided. If a bond issue is involved, legal approval must be obtained, the issue advertised, bids received and analyzed, and the issue awarded. And perhaps most difficult of all are those problems that arise when public opinion divides sharply on the question of local borrowing and the spending policies that the borrowed funds are intended to implement.

As there is no evidence that any of the four districts studied has encountered great perplexity in this connection, the present report gives no further attention to the matter beyond suggesting that the administrative and political aspects of local borrowing may occasionally be more critical than the economic aspect.

Assessed Value

In all four districts, a steady increase was noted in the equalized value of property on the tax rolls. Part of this rise may be attributed to the general upward trend in values of existing properties. Nevertheless, as would be expected, the increase

has been most pronounced in those districts that have had the largest growth in population. Between 1942 and 1954, an increase of 650 percent occurred in valuation of property in District A. This compares with an increase of 500 percent in C and 185 percent in D. For District B, data were obtained only for the period since 1948; during that time equalized valuations grew by 185 percent.

An important question concerns the extent to which residential subdivisions pay their own way in meeting the costs of public schools. Barring for the moment any changes in tax rates, the answer depends on the assessed value at which new homes are placed on the rolls, and on the number of additional school-age children. If equalized valuation per pupil in average daily attendance is used as a measure of a district's ability to finance public schools, it follows that a residential development that adds at least this average amount to the tax rolls for each new school pupil would pay its own way. Less than this amount would tend to raise tax rates, unless it can be shown that school costs per pupil decline with larger enrollments.⁵

Table 11 shows the equalized valuation per pupil in average daily attendance, local taxes collected per \$1,000 of equalized valuation, and, as the product of these, the local taxes collected per pupil

⁵ State-aid payments on an equalized basis modify, but do not invalidate, this relationship. This is true also of payments based on average daily attendance. Aid formulas of both types are used in Wisconsin.

in average daily attendance.⁶ The last may be taken as a measure of the local district's share of the annual cost of educating a child in the public schools.

Table 12 shows the extent to which residential subdivisions measure up to this average in the amount they contribute to the district's tax revenue. As may be seen in column 4, the average tax contribution of improved properties in recorded subdivisions varies from \$64 in District B to \$137 in A. The question remains as to the increment in school attendance associated with the average new residence. This is estimated in column 5.

Columns 6 and 7 show, respectively, the estimated tax contribution per school pupil brought in by residential subdivision, and the percentage this represents of the average cost borne by the local district in educating a school pupil.

It is evident that in Districts A, B, and C, the cost of educating these additional pupils, estimated on the basis of present tax rates and existing average costs per pupil, far exceeds the revenue to be derived from these same properties.

It is not necessary, however, to draw the conclusion that residential subdivisions should be excluded from rural areas. Such a policy is clearly futile. Instead, the essential problem again may be traced to the very small size of school districts. Residential development usually encourages a concomitant growth of commercial property. Where stores, gas stations, restaurants, and even large shopping centers accompany the increase in residential property, the entire tax load does not fall on homeowners. But in districts of small geographic size, like those found in Wisconsin, there is little chance that a diversified property-tax base will grow up in any one district.

More commonly, one district is built up heavily with low-cost homes and has all the school children, while a neighboring jurisdiction with few school-age children enjoys a tax base composed in part

⁶ The significance of the assumption "at existing average cost per pupil" should be noted. Public education may be subject to decreasing cost, in the sense that the cost of teaching additional students may be less than the average cost. This situation probably exists in the one-room school that has excess capacity. But once a school has grown to have two, three, or more rooms, economies of larger scale operation are probably negligible. The quality of education may continue to improve with further expansion, but average costs per pupil are unlikely to continue to fall.

TABLE 11.—*Contribution of local property taxes to cost of education, 1955*

District	Equalized valuation per pupil in average daily attendance ¹	Local taxes collected per \$1,000 of equalized valuation ²	Local taxes collected per pupil in average daily attendance
	<i>Dollars</i>	<i>Dollars</i>	<i>Dollars</i>
A-----	18, 926	11. 31	214
B-----	38, 154	6. 59	252
C-----	25, 603	8. 55	217
D-----	33, 124	5. 74	190

¹Annual Report, Waukesha County Schools, November 1955, pages 9 and 10.

² From tables 4, 6, 8, and 10.

of the commercial establishments that service the residential area. If school districts were larger, a balanced growth in various classes of property would be more probable.

Certain other problems not revealed in available statistics come out in conversations with school district officials and others who are familiar with particular local situations. One example cited is the need for technical advice of all kinds to ease the administrative adjustments that must be made by the rural district that is suddenly struck by suburbanization.

Supervision of a one-room rural school district is likely to be a routine and unexacting duty. So long as population remains small, the administrative functions can be performed on a part-time basis by farmers and other local inhabitants, and no special skill or knowledge is necessary.

The coming of suburbanization changes all this. Almost overnight the district official becomes an agent for borrowing, taxing, and spending on a scale far larger than that to which he had been accustomed.

The political and economic difficulties of increasing taxes are self-evident, and the problems of borrowing have been noted. But perhaps equally difficult are the decisions involved in spending public money wisely. Often new property must be bought, in the process of which due regard must be given to location and the possible need for further expansion later on.

If construction is contemplated, building plans and specifications must be drawn up, bids received, and contracts awarded. At every step, decisions

TABLE 12.—*Proportion of locally financed cost of schooling covered by average tax contribution of improved residential properties, 1955*

District	Average equalized value of improved properties in recorded subdivisions ¹	Local taxes collected per \$1,000 of equalized valuation ²	Average tax contribution of improved properties ³	Estimated increase in school population per additional improved property ⁴	Estimated tax contribution per new school pupil ⁵	Average tax contribution of residential properties, as proportion of average local cost of schooling ⁶
(1)	(2)	(3)	(4)	(5)	(6)	(7)
	<i>Dollars</i>	<i>Dollars</i>	<i>Dollars</i>		<i>Dollars</i>	<i>Percent</i>
A.....	12, 143	11. 31	137	1. 00	137	64
B.....	9, 710	6. 59	64	. 43	149	59
C.....	14, 480	8. 55	124	. 79	157	72
D.....		5. 74				

¹ Average assessed value from tables 3, 5, and 7, multiplied by ratio of equalized to assessed valuation.

² Table 11.

³ Column 2 times column 3.

⁴ Ratio of increase from 1950 to 1955 in number of pupils in average daily attendance to increase from 1949 to 1954 in number of improved properties.

⁵ Column 4 divided by column 5.

⁶ Column 6 as a percentage of the last column of table 11.

are necessary on matters that require not only a high degree of business acumen, but also some knowledge of the law. The officers of a small rural school district, who often have little experience in such matters, would benefit from the counsel of some trained State or county official.

Lag in Growth of Property-Tax Revenue From New Developments

Although local governments in Wisconsin, as in other States, receive some financial assistance from the State, the local property tax remains the principal source of revenue for most units. In 1953, Wisconsin school districts received 33 percent of their general revenue from the State, compared with 62 percent from the local property tax.⁷ For the four districts included in this study, the average ratio of local tax collections to total general revenue was 75 percent in 1953 and 83 percent in 1955.

Efficient administration of the general property tax is important for all local governments, but in a rapidly growing suburb it takes on special significance. The revenue requirements of such a community, it has been noted, tend to increase more rapidly than the tax base, causing upward

pressure on tax rates. To minimize these increases, as well as in the interest of equity, the assessor of property must do his best to bring newly created values into the tax base. Not only should new construction be reflected promptly on assessment rolls, but frequent adjustments are necessary in assessments of existing properties as the press of population causes changing property values.

Where population growth is sudden, an acute problem may arise as a result of the time lag that is often a part of property tax administration. Between the time new improvements are constructed and the initial tax payment is made, as much as a year and a half may elapse. Under Wisconsin law, for example, property is assessed as of May 1. School taxes are levied on this assessment later, usually in July. These taxes become payable during the fall and winter, and are regarded as delinquent if not paid by February 28 of the following year.⁸

Wisconsin law also provides that a building that is not completed on May 1 may be assessed at the value in place on that date. With modern building methods, however, it is not impossible for hundreds of homes to stand completed and occupied at the start of the school year, on a site that

⁷ U. S. BUREAU OF THE CENSUS. STATE AND LOCAL GOVERNMENT REVENUE IN 1953. State and Local Government Special Studies, Number 37. Washington, D. C. 1954. P. 26.

⁸ If paid in instalments, the first is due by January 31, with the balance payable before July 31.

on May 1 had been only an open field. Hundreds of children might be ready to enter school. But under the law, the owners would have no property-tax liabilities against the improvements during their first year in their new homes. On May 1 of the following year, these homes presumably would be added to the assessment rolls; taxes on them would be levied in the summer and would be payable, at least in part, by February 28. Meanwhile, children of these families would have been in attendance at school almost 2 full years.

Perhaps some revision in property-tax administration is needed to reduce the time that elapses between the assessment of property and the payment of taxes. As a further step in this direction, collections might be put more nearly on a current-payment basis. Instead of the single payment, or two-installment, system now used in Wisconsin and many other States, quarterly or even monthly billing might be instituted to regularize the flow of revenue from existing properties as well as to speed the flow of revenue from newly constructed properties.

Relief from this situation might also be found in the use of local nonproperty taxes. A deed transfer tax on the order of that used by many municipalities and school districts in Pennsylvania would be particularly well suited to the needs of a rapidly expanding suburb. This tax, which in Pennsylvania usually is imposed at the rate of 1 percent, applies to the value of real property transferred; it has proved a valuable source of revenue during the period before new homes start to produce property-tax revenues. The administration of such a tax is well within the capability of even a small local unit, and the deterrent economic effects of the tax, in comparison with those attributable to the property tax itself, are negligible.

Lack of Diversity in Property-Tax Base

The lack of diversity in the types of property subject to taxation presents a severe problem in some school districts. Many districts have no commercial, industrial, or public-utility property in their tax base, and must support their functions by comparatively heavy taxation of residential or farm property. Indeed, districts exist where residential property alone comprises the entire

tax base. These districts are deprived of any benefit that might be obtained from nonresidential property within their borders.

Zoning ordinances often serve to discourage residential building in areas that would provide valuable industrial or commercial sites. But the effectiveness of zoning in small areas is limited. A school district, for example, that covers only 5 or 6 square miles, may have no property that is suitable for business use or even for large and more valuable residences. Thus, development throughout an entire school district may be confined wholly to low-value residential property, which adds but little to the tax base.

Moreover, the usual form of zoning, based on a town (township) or county, actually tends to aggravate imbalance in the development of individual districts. Division of the larger area into segments that are suitable for residences, or for industrial or commercial development, may easily produce the result that one school district is predominantly residential, another heavily industrial, and a third built up with stores and other business establishments. As a consequence, zoning ordinances offer little hope, and may even constitute a threat, to balanced growth of the property-tax base in areas as small as the school districts studied here.

Finally, a difficulty that in individual districts may be more fundamental than any mentioned earlier results mainly from the inability or unwillingness of responsible officials and established residents to recognize the coming of suburbanization and to anticipate its effects. Occasionally, those in control of local government refuse to take the steps necessary to supply school facilities for the children of newcomers to the district. Opposition arises to proposed increases in property taxes, and such a question as a school-bond referendum may become explosive.

In the face of a persistent growth in population, resistance of this kind can be little more than a delaying action. The usual result is that within a few years the older residents lose control to the newcomers, who must then attempt to accomplish at an accelerated pace that which should have been done gradually in earlier years.

Far more auspicious is the situation in which residents of long standing cooperate with newcomers to meet their common problems. A rural

community that, in time of suburban growth, is fortunate enough to have leaders who can look ahead and map the moves necessary to cope with a rapidly expanding population may avoid many pitfalls.

Conclusions

As indicated at the outset, the purpose of this study did not include developing a program by which local government can cope with suburban expansion. One general conclusion, however, cannot be overlooked: The four districts studied, and by inference others like them, are handicapped by their small size in making adjustments forced on them by suburbanization.

Small school districts have often been favored, from the farmer's viewpoint, as a means of preventing the urban population from shifting part of the cost of education to the owners of a farm property. So long as residential development can be kept out, this policy may actually hold taxes down. But when population begins to move into formerly rural areas, the balkanization of local government, pursued originally as a defense measure, becomes itself the source of many problems.

A school district of 5 or 6 square miles is likely to encounter two major difficulties. One is the educational problem of providing a well-rounded school program. Unless the district includes much residential property, the school population is too small to warrant facilities more elaborate than a one-room school—an institution that perhaps has had much historical and social importance, but which is surely out of date by modern standards of education.

The second problem, and one of more immediate concern, pertains to finances. Not only are very small districts handicapped in supplying adequate school facilities and programs, but they often have a financial disadvantage. The problem is most critical where a rapid increase in population forces school expansion; but the disadvantage exists even where the school situation is not complicated by population growth.

Small-scale purchasing, for example, is almost certain to be uneconomic. Small-scale borrowing, too, is likely to be on terms less favorable to the school district than are those that apply on loans or bond issues of larger jurisdictions. The cost of legal proceedings and of legal advice is still another charge that weighs relatively more heavily

on a very small district than it does on a larger jurisdiction that may be able to use the services of a lawyer on a retainer basis, and whose officers may also be versed in legal matters.

A large school district possesses an advantage in budgeting outlays that a small district does not have. A county school district, for example, may budget a certain amount of capital outlay each year, so that continuous expansion can be accomplished more nearly on a pay-as-you-go basis. But a small district often goes along for years with little or no capital outlay, and then suddenly is required to undertake an expansion program that, though small by most standards, may nevertheless stagger the small district. The transition from a one-room to a two-room school presents such a problem. A similar budgetary jolt may occur when current expenses rise suddenly to a new level, as when it becomes necessary to employ a second teacher.

Still other problems face the small school district and handicap it in meeting the problems that usually accompany rapid residential development. Probably the strongest financial asset a local unit has for meeting demands created by suburbanization is a diversified and adequate tax base. A balanced rate of growth must be maintained among the various forms of property, so that the increase in residential property is accompanied by new industrial, commercial, and utility construction. But the limited possibilities for diversification in the tax base of the small district have been noted. The likelihood is strong that one district may have considerable agricultural, industrial, or utility property, but few residences, and consequently little demand for school revenue. An adjacent unit may be solidly residential and have little property that is suitable or that is reserved for business purposes.

The implications are obvious. Growth of population, unaccompanied by growth in assessed values of business, industrial, or utility property, throws a heavy burden of taxation on residential property and on the remaining farm property. In a large district, say a county, the cost of rapid expansion of schools in one part may be partly absorbed by taxes on property in the unaffected portion of the district. The transition from a rural to an urbanized area is thereby facilitated. Although the development in particular sectors

may be rapid, for the district as a whole it is more gradual.

But in small districts, such as those in Wisconsin, residential building is likely to blanket all or most of the area. Established properties may not have enough assessed valuation to support a rapid growth of local services. The community must raise itself by its bootstraps, as it were, from a very low level of local services associated with its former rural state to a community with highly developed suburban government.

Wisconsin is not alone in having a large number of small school districts. New York, for example, had an average of more than 50 separate and independent school districts per county in 1952. But this multiplicity of school districts is most common among the States of the North Central region. In 1952, Nebraska, with 93 counties, had 6,392 school districts, an average of more than 60 per county. Minnesota, in the same year, had 6,227 districts, an average of more than 70 in each of its 87 counties. Michigan and South Dakota each had an average of more than 50 districts per county.

Apart from the recommendation that school districts be consolidated, several other suggestions grow out of this study. Like the basic conclusion regarding creation of larger school districts, these recommendations are not translated here into a specific program for action. Rather, they are intended to indicate possible areas for further and more detailed study.

Earlier we mentioned the use of a deed-transfer tax as a source of revenue to the local unit during the period before heavier reliance can be placed upon property-tax revenue. In most States, legislative action perhaps would be required to make such taxes available to local units, and safeguards would be required to avoid misuse. But the experience of rapidly growing suburbs in Pennsylvania, many of them small, indicates the potential advantages in the use of such a revenue measure.

Study may appropriately be given also to the possibility of improving local controls over land use. At present, zoning is an ineffective and perhaps a perverse instrument for controlling land use, so far as the small school district is concerned. If larger governmental units cannot be achieved through consolidation, attention might be devoted

to methods of applying zoning controls to encourage a balanced growth within small districts. Other techniques also may prove useful in controlling suburban development.

In Wisconsin, proposed plans for residential subdivisions now require approval by the town, the county, the State and, if one is involved, by the city or village. These approvals, however, at present are largely perfunctory and provide little or no safeguard against the creation of difficult local finance situations. Stricter control at this stage might do much to avoid some of the more troublesome problems of school finance.

There are special problems of property assessment in rapidly growing areas that merit study. More refined techniques might be developed to assist local assessors in keeping abreast of new construction and in adjusting assessments of existing properties to reflect changing values. In the rural-urban fringe, valuation of farm property presents a particularly difficult assessment problem. Basically, the question is whether such property should be assessed at values comparable with other agricultural property, or whether its potential for residential development should be recognized in the assessment. This question, though not new, is becoming more critical as population presses farther into rural regions.

So long as school financing is conducted separately in small districts, questions will continue to arise concerning the application of local taxation to public-utility property. Many States have recognized the capricious effects of local taxation of utility property, and have replaced the property tax with some form of State taxation. Others continue to apply local tax rates to the State-assessed value of utility property in each jurisdiction. The frequent result of this practice is that a school district with a railroad, pipeline, or power-transmission station may have more revenue than it needs, while a neighboring district with no utility property starves. More equitable distribution of tax revenues from public-utility property would help to relieve the burden of property taxation in heavily residential localities.

The effects of the present Wisconsin system of taxing public-utility property were illustrated by Frederick W. Haberman, of the University of Wisconsin. In a recent address before the Wisconsin Conference on Education he stated:

"On the Wisconsin River 30 miles to the north of Joint District #1 are two attractive villages, Prairie du Sac and Sauk City. Sac has 1,400 population and \$3.3 million of full value residential property. Sauk has 1,700 people and \$3.4 million of property. The residents of both villages catch blue channel cats in the river, use electric power generated by the Wisconsin Power and Light Company, and look at the high tension towers of that utility plant when they go for constitutionals. But there is a difference. That hydroelectric plant is located in the Sac school district. Sac, therefore, gets \$14,350 as its share of the utility tax for its school treasury; Sauk gets \$100 because it has a few poles hither and yon; Joint District #1 gets none."

A final suggestion for further study concerns the sharing of financial responsibility between the

State and its local subdivisions. In view of the joint interest that State and local governments have in public education the question arises as to the proportion of school revenue that should be supplied by the State and the proportion left to be raised by the localities. A further question concerns the State's responsibility for schools in the districts where rapid growth of population renders present facilities hopelessly inadequate.

This report makes no attempt to define these areas of responsibility or to propose formulas for sharing school costs. But evidence suggests strongly that shifting populations alter the role of local units in public education. If this is true, it follows that in many States existing arrangements for financing public schools need to be reexamined.



Marketing High-Protein Wheat in the Northern Great Plains

By Clive R. Harston

For years, individual problems raised by the marketing of high-protein wheat have been overlooked, or at best only mentioned in passing. But recently they have been investigated in a study conducted at Montana State College by the Endowment and Research Foundation under contract with the United States Department of Agriculture. This basic survey included personal contacts with many producers, country and terminal elevator operators, flour millers, and commission firms. The complete report, which is due for release soon, analyzes supply responses, country elevator operations, and demand conditions. It recommends changes designed to improve the handling of high-protein wheat. The following article contains some of the highlights of the report. The contribution is from Montana State College, Agricultural Experiment Station, and is Paper No. 392, Journal Series.

CONSUMER'S DEMAND for wheat products as reflected through bakers, millers, and elevator buyers is distorted and lacking in clarity for producers. Hence they find it difficult to produce what consumers desire. Standards of quality at the consumer level apparently are foreign to factors of grade that dictate prices at country elevators. In turn, grade factors that influence the price of wheat at the country level are unknown to consumers.

Moisture content and wheat damage, the storage problems faced by those who hold wheat, are of no concern to consumers. On the other hand, contamination is a problem of vital concern to consumers, yet they have practically no way of differentiating clean from contaminated wheat when they buy wheat products in grocery stores. But consumers may learn of the existence of this quality factor through the publicity given contamination by our institutional agencies assigned to protect consumer health.

Marketing the percentage of protein contained in wheat embodies several characteristics. Protein cannot be separated from the wheat berry, yet its marketing is a part of the marketing of wheat. It is not a grade factor, although it is quoted and priced separately. The premium actually paid is for the percentage of protein, not for protein by weight.

The premium for protein percentage is partly a function of the relationship between the supplies of a high-protein wheat relative to the supplies

of hard red wheat in general. Wheat supplies respond partially to the price of wheat—as price increases, growers increase production. But the supply of high-protein wheat that is produced has a limited response to price stimulus. It is primarily a function of climate. However, with the current programs demanding considerable storage of wheat, the supplies of the high-protein wheat placed on the market do have a noticeable response to market premiums. High-protein wheat tends to move directly to the milling trade through the free market.

Test weight of wheat has an important influence on price, but it is of milling concern only and of no interest to bakers or consumers. Though foreign material is of consequence to the marketers who handle wheat, consumers know nothing about it. Even percentage of protein as a price determinant loses its identity to a great extent as it goes to consumers because the dietary value of protein is not the main consideration. Its importance is in the processing to produce a desired loaf, but the relationship of protein percentage to quality is not absolute nor certain. Consumers register demand for protein only in their demand for a large loaf of bread or for the specialty breads that require high-protein flour.

Demand for Wheat Quality by Flour Millers

Consumer demand is reflected by bakers as they attempt to satisfy consumer preferences, but they add demand factors peculiar to the baking proc-

esses. Added to these is the miller's demand for a wheat that will mill out a good percentage and maintain quality while being held in bins.

Important milling qualities in wheat that flour millers want are: (1) Heavy test weight wheat; this quality is directly related to yield of flour. (2) Round, well-shaped, uniform kernels, a quality associated with yield and ease of milling. (3) Low moisture content, which reduces storage problems. (4) Freedom from smut, damage, and contamination. To a great extent, all these factors are reflected through wheat grades, and wheat price differentials for different grades give producers an incentive to produce what millers want.

In addition to their own desires for a good milling wheat, millers' demand for wheat must reflect the peculiarities of bakers' demand for flour. Important baking qualities of wheat demanded by bakers include: (1) Desirable mixing, tolerance, mellowness, elasticity, water absorption, low ash content, and gassing power or loaf volume; (2) desirable texture of the flour and bread; (3) desirable color of bread; and (4) fermentation time. These qualities are not directly related to the grain grades, but to a greater or lesser degree they are associated with the crude protein in wheat.

Protein Quality

Baking quality is not accurately measured by the crude protein test, but the degree of association is high enough to warrant the establishment of protein premiums on the market as a means of allocating the desirable wheat to its best use.

The relationship of protein content with baking quality for hard red spring wheat has been studied by Aitken and Geddes, who made the following statement: "In studying this phase of the question, Larmour (1930) concluded that correlation coefficients for wheat protein quality, as measured by the bromate baking method, were in practically all cases sufficiently high to warrant concluding that the relation is significant enough to justify the commercial use of the protein test as a factor in the classification of hard spring wheat."¹

¹ AITKEN, T. R. AND GEDDES, W. F. THE BEHAVIOR OF STRONG FLOURS OF WIDELY VARYING PROTEIN CONTENT WHEN SUBJECTED TO NORMAL AND SEVERE BAKING PROCEDURES. Board of Grain Commissioners, Grain Research Laboratory, Winnipeg, Canada. Reprinted from *Cereal Chemistry*, 11: 487. Sept. 1934.

To most producers of high-protein wheat, protein content is assumed to be the indicator of quality. The quantitative measure has been assumed to be the qualitative measure because in the past there has been little or no difference in protein premiums for different varieties of wheat. The premiums for 15-percent Thatcher (highly desirable wheat) and 15-percent Spinkota were the same for a long time, even though Spinkota produced an undesirable loaf of bread. Currently, a price discount is quoted for Spinkota.

Millers and bakers are unanimous in their agreement that the protein test and the old gluten test are not adequate measures of baking quality. It is agreed that the only conclusive measure of baking quality in use today is actually to bake the loaf of bread. But each miller has a different definition of quality based on his judgment of the importance of each quality characteristic.

Aitken and Anderson conducted a study to ascertain the suitability of new varieties by tests performed simultaneously by 20 collaborating chemists in Canada, the United States, and Great Britain. There was a general lack of agreement among the cereal chemists as to the value of the seven varieties of hard red spring wheat submitted with respect to overall quality. They concluded the result of their findings with the following statement:

"Several explanations are offered which may account for the variations in opinion found, and among these are: The use the collaborator intends to make of the wheat; the properties given most weight in assessing overall quality; the volume of testing done; the interpretation of the data; and the principles underlying comparisons. On the other hand, some collaborators have opposite opinions on specific qualities of the same variety that are difficult to understand.

"The results of the investigation show that cereal chemists hold different opinions on what constitutes bread-making quality and on how this should be measured. The difficulties of reaching decisions on the merits of new varieties are all too apparent."²

² AITKEN, T. R., AND ANDERSON, J. ANSEL. CONFLICTING OPINIONS ON THE QUALITY OF BREAD WHEATS. Grain Research Laboratory, Board of Grain Commissioners for Canada, Winnipeg, Manitoba. April 1947. p. 18.

Millers are constantly faced with the danger of buying by protein content but finding the delivered wheat of inferior quality regardless of its desirable protein percentage. As soon as possible in each harvest season the quality control laboratory conducts tests of wheat from the many different supply areas, and purchases throughout the year are conditioned by the results of these tests.

Millers in the spring wheat area are interested in preserving the high-quality varieties now grown in the Northern Great Plains and preventing undesirable varieties from being produced. The milling trade in Minneapolis finances the Northwest Crop Improvement Association which is established to encourage the production of desired varieties of wheat from the milling standpoint. The secretary of this association works closely with State experiment stations, producers, and wheat handlers.

Producers are becoming more aware of the long-run advantages of fitting production to the needs of millers and bakers. Recently organized crop-improvement associations of producers are meeting with favorable producer response. Leaders of these groups believe that continued production of varieties that are high yielding, but are poor in milling and baking quality will result in the loss of the favorable competitive position of hard red spring wheat among other classes of wheat.

Major Marketing Problems

Country elevator operators must grade and describe wheat accurately if they are to serve farmers properly and protect their operating margin. To grade down means to pay farmers less than the market dictates; to overgrade means to cut their own margins. It is not always easy to ascertain a test and grade in the country that will coincide with the terminal description. Herein lies a problem of the marketing channel. Care in sampling, skill in grading, accuracy of the protein test, precise test for moisture, and similar technical precautions are of constant concern to alert operators.

A major problem of an elevator manager is to ascertain the protein content of each producer's wheat. It is difficult to estimate protein content accurately by inspection. It is not easy to obtain an accurate sample of a producer's wheat for a laboratory test. Considerable time is required to

obtain results of a protein test from a laboratory. As a result, operators tend to modify and average out the premiums paid for protein to help cover losses from unplanned blending and errors in protein determination.

Elevator managers are much interested in a type of quick protein test that might be done at country elevators. If used, such a test would be a binning aid primarily, not a replacement for the Kjeldahl laboratory test as a basis for determining protein for buying.

Though elevator operators surveyed indicated they were eager to learn of any development that might lead to a simple and quick protein test, none had had any experience with such a test.

At least four quick tests for protein in wheat have been developed: (1) Sedimentation test, (2) photometric method, (3) biuret reaction method, and (4) a method developed by the Western Wheat Quality Laboratory of the Agricultural Research Service at Pullman, Wash.

Those who have developed quick protein tests are confident that the tests are useful in the country. This is particularly true of the sedimentation test. The problem is to inform those who handle wheat in the country of the equipment required, how to conduct the test, and how to use the results.

Baking quality is not adequately reflected in the grade, class, protein, and other such factors. Millers buying on a point-of-origin basis rely upon their detailed baking tests of wheats from their supply points. This practice complicates the problems of elevators. One year an operator may have just what he wants, and the next year his wheat sells at a discount with no explanation that can be found in existing grading practices.

Accurate sampling and testing for protein is a problem. It is difficult to guess protein by inspection, yet wheat must be bought on today's market though results from a protein test will be delayed several days. Errors in the protein test may occur, but the main difficulty is in sampling.

Variations in Protein Percentages

Individual elevators received an average variation in wheat protein percentage of 5 percent in 1953 and 6.6 percent in 1954. In both years, the greatest variation occurred in eastern Montana. Table 1 indicates that all elevators do not face the

TABLE 1.—*Variation in percentage of protein in wheat delivered to 44 elevators in the Northern Great Plains*

Area	Average variation	Range in variations	Frequency distribution of variations (number of firms)				
			Below 3.0%	3.0-4.9%	5.0-6.9%	7.0-8.9%	9.0% and over
1953	Percent	Percent					
Central Montana-----	4. 92	3. 0- 7. 3	0	8	4	3	0
Eastern Montana-----	5. 95	2. 0-12. 0	2	3	9	3	1
Western North Dakota-----	3. 70	. 7- 7. 1	3	4	3	1	0
Total-----	5. 0	. 7-12. 0	5	15	16	7	1
1954							
Central Montana-----	6. 22	3. 0- 9. 0	0	3	6	2	3
Eastern Montana-----	7. 35	4. 5-11. 0	0	2	6	6	5
Western North Dakota-----	5. 66	3. 0- 9. 0	0	5	3	2	1
Total-----	6. 6	3. 0-11. 0	0	10	15	10	9

same severity of the problem. During 1954 the range in variations was from 3 to 11 percent.

According to law, country elevators must accept storable wheat delivered to them if they have bin space. The acuteness of the segregation problem is clear from the number of different grades and the range in protein content of wheat delivered to the typical elevator. In addition to wheat, they must handle other types of grain, reserve working space, and keep Government loan grain separated from nonloan grain.

Price Determination

Country markets learn terminal market conditions without delay through radio broadcasts and telephone conversations. Most managers receive written reports from the grain exchange within 24 hours after the market closes.

Up-to-the-minute price reports for buying in the country do not assure elevator operators a profitable sale price, hence they tend to modify and to delay making price changes. To a limited extent, the pricing is done for them by firms and individuals supplying price letters and cards. Margins allowed by the Minneapolis Bulletin Card quotations are wider than necessary for Montana wheat. This fact is pointed out by the custom of paying Card price plus. The Card quotes a price for low-quality wheat that would permit a small, below-average operator a reasonable profit.

The market does not always quote premiums for 17 percent protein or higher, and when it does the premiums quoted are low relative to the value of this high-protein wheat for blending with lower protein. In this instance neither the country elevator nor the terminal market is adequately reflecting the true value of wheat.

Risk and Uncertainty

A binning problem results from deliveries of two or more kinds of grain, more than one class of wheat, a variety of grades, and wheat of differing protein content delivered during a rushed harvest. Government-loan wheat that is stored in country elevators aggravates the situation. Blending becomes haphazard and uncontrolled, rather than deliberate for quality control.

Wise blending can prove profitable when premium spreads are not uniform, but unplanned mixing limits operators' ability to take advantage of premium spreads.

To all who handle wheat, a major problem is the risk and uncertainty of changes in price. Country elevator operators feel the strain because they maintain title to wheat for a considerable time. Grain shipped from most elevators in the Northern Great Plains takes from 1 to 2 weeks to reach terminal markets. Boxcar shortages extend the time that wheat must be held and increase uncertainties as to price.

A partial hedge can be carried on the base price of wheat, but the protein premium cannot be hedged on the futures market. Yet premiums represent from a tenth to a fifth of the total price of wheat.

The problem of risk and uncertainty can be emphasized by summarizing the causes of price uncertainty.

Wheat prices change over time. Protein premiums change over time but not always directly with the base price of wheat. The premium spreads between protein categories fluctuate. Where buyers buy on the individual protein basis and are forced to mix before shipping, there is a risk of premium loss from a difference between the average of premiums paid and the premium received. Premiums paid are based on the laboratory test for protein, yet the value of the premium is based on baking tests in the mills. Price discrimination results on an area basis, for reasons that do not appear in the grading or protein test.

Recommended Practices for Handling and Marketing

Producers normally respond to premiums by increasing production, but in the case of high-protein wheat the response appears to be relatively small. All productive input factors that affect percentage of protein are not, however, beyond the control of producers. Farmers can plant varieties with known high-quality and high-protein content. They can fertilize to increase not only yield but protein content as well. Their tillage practices—summer fallow, clean fallow, rotation—also affect protein. In this process, each producer must attempt to increase the percentage of protein in his wheat up to the point where the additional cost of these practices is equal to the average added premium from the wheat sold. But a good deal of uncertainty will still be associated with attempts to increase protein content, because premiums are unpredictable and results from the practices mentioned are not precisely known, owing to adversities of the weather.

Farm Handling and Marketing to Satisfy Market Demands

Handling wheat after it is grown offers an opportunity to comply with the peculiar demands

of the market. Country elevator operators and progressive farmers have recommendations for farmers that, if carried out, would facilitate elevator operations, permit a smoother flow of the product through the market, and permit farmers to take advantage of protein premiums.³

1. Farmers should store wheat on the farm until after harvest.

2. If farmers hold back deliveries until after the rush of harvest they can do a better job of merchandising wheat of different protein content. Rapid deliveries during harvest force elevator operators to commingle and, upon occasions, to sell at a disadvantage. Wheat that is suspected by producers of having a different protein content from other wheat should be kept separate to as great an extent as possible. Where considerable variation in protein is found, the binning of wheat from different fields separately would be required in many cases.

3. Farm-stored wheat should be sampled and results of the protein test learned before delivery.

4. It is desirable to know the approximate protein percentage of wheat delivered to elevators regardless of whether it is farm-stored. With this knowledge, producers can wisely choose between selling or placing grain under Government loan.

5. Farmers should be alert to price changes that might mean profits if Government loans are redeemed. Some wheat remains in storage under loan after premiums have increased enough to make it profitable to sell on the market, because producers do not watch current price and premium changes relative to the loan price.

6. Producers should take the utmost care when sampling bins for protein tests. Frequently, the discrepancy between laboratory protein tests could be attributed to careless sampling rather than to errors in the test. Many elevator operators have refused to accept results of protein tests from samples submitted by producers primarily because samples have not been randomly selected.

Producers who make these suggestions are not unaware of the difficulty of carrying out some of them. At harvest time the pressing problem is to get the entire crop harvested and to make the fullest use of the existing farm storage facilities. At this time, protein segregation is often regarded as a less important management consideration than others.

Recommendations to Country Elevator Operators

A few managers of country elevators have learned to handle high-protein wheat in a way

³A survey was made of country elevator operators and farmers in the high-protein-wheat-producing areas of Montana and North Dakota.

that permits them to pay the highest protein premiums to producers. Following are recommendations by operators of this type, together with suggestions made by commission merchants, millers, and wheat producers.

The Money Is In the Mix

Elevator operators who pay big refunds to patrons or profits to owners assert that blending and mixing know-how makes the money. To take best advantage of protein premiums, blending must be done wisely in accordance with premium spreads. This means constant changing of mixes. Because of changing premiums no one mix will always pay. In fact, blending for protein alone will not pay if the spread between each protein category widens as the protein increases, but this is not the case at all times.

Mixing wheat to control not only protein content, but also test weight, moisture, grade, dockage, and other similar factors, is recommended. Sometimes a loss from mixing the test weight down will be offset by an increased protein test; at other times the compensation will be from an improved test weight at the expense of the protein test.

Minneapolis and west coast markets seldom establish premiums for 17-percent protein, with a margin above 16 percent equal to the spread between 15 percent and 16 percent. For this reason, grain handlers have found it less profitable to ship 17-percent wheat than to use it in a blend to bring up the protein of other wheat. The same would apply for wheat above 17 percent. The spreads tend to increase up to 16 percent but decline above 16 percent protein.

The prerequisite to careful, controlled mixing of wheats is a knowledge of what is in each bin and a comparatively complete job of segregation. Constant observation of prices and premiums is a necessity. A flexible program for mixing and selling is required.

Measure Grade and Quality With Precision

The protein content of wheat purchased must be ascertained as accurately and as soon as possible. Although many grain men discredit the claim of others to be able to estimate protein content of wheat from inspection, it is nevertheless worth while to develop such skill, and some opera-

tors are profiting from it. They are aided by a knowledge of the past history of protein content of each producer's wheat, by careful observation of differences by area within their trade boundaries, by an understanding of factors that have an influence on the protein content, by ability to distinguish between varieties, and by a notion as to the kernel appearance—color and vitreousness—of high- and low-protein wheat.

Early protein tests aid in estimating protein content. Samples should be submitted frequently for as many lots of wheat as practicable. Pre-harvest tests have not proved reliable enough to give much help, but there is a question whether they have been given an adequate trial. Among elevators in areas of considerable protein variation, the probing of farm bins before delivery is of greatest importance. With a knowledge of the protein content of wheat yet to be delivered, an operator is prepared to bin and to sell in such a way as to gain maximum benefits for both producer and elevator.

Many errors in pricing result from inaccurate samples. Only one gram of wheat is actually used for the test, but that one gram must accurately represent an entire carload of wheat. Each truckload should be sampled by taking at least 5 to 10 drafts from various parts of the load. Samples taken from bins can be representative only if the probe picks up wheat from several places in the bin and not just from the most convenient places.

Samples of wheat held in elevators in uncovered containers will dry out to 8.5- or 9-percent moisture in a few days. The protein test on this sample will be too high for the wheat in the bin. It is imperative that samples be taken carefully, and held in elevators and shipped to laboratories in moisture-proof containers.

The adoption of a quick test for protein that could be done in the elevator would help solve some elevator problems.

Segregate by Protein Content to as Great an Extent as Possible

The degree of segregation will depend upon the variation in the percentage of protein found in wheat delivered to each elevator. Two categories in the low-protein areas may suffice, but three separate groups as a minimum are suggested for areas of considerable variation.

TABLE 2.—Average number of bins required for adequate segregation suggested by elevator managers, by volume of grain handled

Bushels of grain handled (thousands)	Operators making recommendations	Number of bins	Number of bins by size of bins										
			500	1,000	1,500	2,000	2,500	3,000	3,500	4,000	4,100-5,000	5,100-10, 000	11,000 and over
	<i>Number</i>		<i>Average number</i>										
Under 200-----	8	25	0. 6	6. 1	0. 3	5. 3	1. 7	2. 0	1. 4	5. 1	2. 0	0. 3	0. 4
200 to 400-----	12	24	. 5	3. 2	1. 7	4. 0	2. 6	4. 3	0	4. 4	2. 0	. 3	. 4
400 to 600-----	10	23	1. 2	1. 8	1. 9	5. 3	. 6	. 4	2. 7	4. 0	2. 8	1. 1	1. 2
600 to 800-----	4	32	. 5	. 7	. 5	5. 2	2. 5	4. 5	1. 5	2. 0	5. 5	10. 0	. 0
800 to 1,000-----	3	26	. 0	. 0	1. 7	2. 0	3. 3	. 0	. 0	15. 0	1. 3	2. 3	. 0
Over 1,000-----	2	36	. 0	6. 0	. 0	10. 0	. 0	. 0	. 0	7. 0	5. 0	8. 0	. 0

The purpose of separate binning is to be in a position either to sell each category separately or to blend proteins to obtain a blend that will sell to an advantage. How failure to separate high-protein wheat can penalize trade in grain is highlighted in an article in the *Farm Journal* for August 1954, which states:

"Japan wanted to buy eight cargoes of 11 percent or 12 percent protein wheat this month, but CCC officials in the Pacific Northwest, who have 85 million bushels of 1953 wheat on hand, couldn't scrape up one cargo because practice has been to dump all wheat in the same bin, regardless of protein content."

Recommended number and size of bins.—Lack of enough bin space is one of the most difficult restrictions on separate binning. There should be a trend toward building elevators to accommodate the needs under the current marketing structure. Elevator operators were requested to recommend the number of bins of different sizes that would permit adequate segregation of wheat by protein content. Table 2 is a compilation of the suggestions made by 39 elevator operators in the area of Montana and North Dakota that produces high-protein wheat.

Based on these suggestions by elevator operators and other observations, recommendations were compiled for number and size distribution of elevator bins (table 3).

Not only number of bins but their size is important. Some of the better managers emphasize the importance of having at least two or three small bins (probably overhead bins) for temporary storage of a truckload of grain of uncertain quality. Operators find it difficult to force producers to

take their wheat back home if it is too wet, for example. So they receive it, store it separately in a small bin, and ask the growers to deliver no more grain with the same undesirable characteristics.

Bins of 10,000-bushel capacity or more are not desirable because it is impossible to segregate wheat placed in them. Any operator finds it difficult to guess how much of each grade or protein percentage will be delivered to him in a season. If he starts to fill a large bin with a specific grade and receives enough to fill only half of the bin he is faced with unused storage capacity or the necessity of commingling wheat of different qualities.

Recommended unloading and elevating facilities.—According to the great majority of elevator operators, only one unloading pit is necessary. If bins are divided into two houses, a receiving dump is necessary in each.

Two elevator legs are recommended for each elevator, regardless of size, except when volume approximates a million bushels per year. For that quantity an extra leg, to be used primarily for cleaning, would greatly facilitate handling of the grain. Elevators with a small annual volume may require a third leg if cleaning of grain represents an important and sizable part of the services rendered.

Elevator legs with an hourly capacity of 2,500 bushels are suggested for elevators that handle up to 400,000 bushels per year. Elevators with a greater volume may find a faster leg worth while, but probably not over 3,500 to 3,800 bushels per hour. If an elevator leg is added for cleaning grain, 1,500 to 2,000 bushels per hour is the desirable size. Two legs with a capacity of 2,500 bushels each could unload about 16 trucks in an

TABLE 3.—*Recommended elevator bin number and size distribution for adequate segregation*

Bushels of grain handled (thousands)	Number of bins	Number of bins by size of bins						
		500	1,000–1,500	2,000–2,500	3,000–3,500	4,000	5,000	5,500–10,000
		<i>Number</i>						
Under 400_____	25	2	4	8	4	5	2	0
400 to 800_____	30	2	2	6	4	5	5	6
800 to 1200_____	35	2	2	6	0	10	5	10

hour. This is more trucks than can be weighed, emptied, and cleaned in an hour. Hence, usually one leg is free to load out cars while the other is elevating grain from the receiving pit.

It is absolutely necessary to have two legs if wheat is to be segregated adequately by grade and protein, according to several of the more successful elevator managers. If there is considerable variation in grade and protein percentage, the two legs available will permit emptying the pit between loads. One leg of 3,500 to 5,000 bushels per hour capacity could empty the pit between loads, but the inability to unload trucks and load out a car at the same time would be a disadvantage.

Segregation made possible with suggested plant arrangement.—On the average, each firm could make at least two more segregations if they had the number of bins of the various capacities and other facilities that are suggested as most desirable. Present arrangement and facilities are as good as could be desired according to some; but others could double their separations with an improved elevator layout.

The number of bins is not the principal limiting factor to greater segregation in many cases. Less than half of the elevators have fewer than the suggested number of bins. The number of bins available in some cases is larger than the manager thinks is absolutely necessary to do a good segregating job.

The most effective factor in segregating adequately is the operator's skill and ability to estimate protein percentage at time of delivery. Some operators with relatively few bins are segregating to a great extent, but others with many bins segregate very little. Remodeling to increase bins, change the size of bins, or add an elevator leg, is not practicable in all cases. Adding

an elevator leg is particularly expensive, yet an additional leg is the most pressing need, according to the managers interviewed.

Operational adjustments to increase protein segregation.—The majority of elevator firms have adequate facilities to permit separating wheat into at least one more protein category without building additional bin space or adding other facilities. Usually it would require an adjustment in the use of bins. Setting aside an extra bin or several bins to accommodate additional separation may result in some unused bin space if the manager cannot estimate correctly the quantities of wheat with different protein percentages that will be delivered. About two-thirds of the managers would expect a decline in volume handled if they were to increase segregations. This would not necessarily be true if wheat came in slowly, but at harvest time producers are not patient if they are delayed while the elevator pit is being emptied between loads.

More than half of the operators reported that an adjustment in the use of the unloading and elevating facilities would be necessary. Some time is lost when they must switch from bin to bin after each load. In most instances, this is a problem at harvest time but not a serious limitation after the harvest rush. Only 5 percent of the operators estimated that additional help would be required if they were to segregate into one more protein category.

Decreasing Risk and Uncertainty From Protein Premium Changes

Decreasing risk and uncertainty, though a challenge to elevator operators, is possible. It can be done in ways that follow:

1. Some shippers propose that risk is minimized if high-protein wheat is sold quickly.

2. "To-arrive" selling has many advocates, especially among the high-protein producers at the greatest distance from the terminal markets. Shippers sell wheat before it leaves the elevator. It may be loaded in the car-track sale—or held in the bin with shipping date specified. In fact, the "to-arrive" sale price might be determined and the sale consummated before the wheat is bought from the producer. Elevator operators are able to learn the margin they are to receive. They need not fear a price decline while wheat is enroute, but they must forego any advantage that might come if the price increases. A shipper must weigh his gains from decreasing the uncertainty in price by "to-arrive" pricing against the losses from discounts on "to-arrive" transactions and the probability of gains in price while wheat is enroute. Cash wheat often brings quality premiums that "to-arrive" sales do not get because buyers cannot see the wheat to make sure of quality factors. In some areas where wheat has a quality reputation of long standing, buyers will pay full spot cash or more for wheat while it is still in the country.

3. Deferred pricing (mill storage, or terminal storage) may help country elevator operators to hedge against premium changes. One way deferred pricing works is for the country shipper to ship grain to his commission mer-

chant for future pricing. The commission firm disposes of the wheat to a miller with the future pricing agreement. When the shipper decides to sell, he notifies the commission firm, who in turn notifies the mill buyer, and the price is established as of that moment, based on the cash market. The elevator operator can buy wheat on today's market in the country and sell an equal quantity that is held in terminal storage on today's market. He ships wheat he has bought and it goes into terminal storage to take the place of wheat sold.

One of the problems of deferred pricing is to find terminal storage and a mill buyer who is willing to bear the risk that comes to him in a deferred pricing transaction. Deferred pricing is used to a limited extent but the success of this scheme might be decreased if a large number of shippers attempted to use it.

4. Grain handlers located near the line of east-west movement should carefully observe both the eastern and the western markets and ship to the one that shows the greatest differential above freight costs. A flexible marketing program is required.

5. The seriousness of the problem of uncertain protein premium suggests the need for a study of the economic feasibility of establishing an extension to the grain exchange futures contracts to cover protein premiums.



Book Reviews

Social Characteristics of Urban and Rural Communities, 1950. By Otis Dudley Duncan and Albert J. Reiss, Jr. John Wiley and Sons, Inc., New York. 421 pages. 1956. \$6.50.

THIS is a volume in the Census Monograph Series, co-sponsored by the Social Science Research Council and the Bureau of the Census. The objective is a descriptive analysis of census data classified by types of American communities. With exceptions, the data are from the 1950 Census of Population, particularly the report *Characteristics by Size of Place*. The authors treat five factors as independent variables: Size of community, location with respect to metropolitan centers, pattern of population growth or decline, type of economic specialty, and region of location. Their hypothesis is that "differentiation among communities in one or another of these basic characteristics is associated with variation in other characteristics." The other characteristics are the range of items available from the population census such as age, sex, race, education, mobility, and occupation. Interpretive comments are deliberately limited.

The special usefulness of this study to workers in agricultural economics lies in the detail it presents on characteristics of rural population. Instead of the usual farm-nonfarm dichotomy of the rural population, special tabulations permit a fourfold classification showing data for villages of 1,000 to 2,500 population, villages of less than 1,000 population, open-country rural nonfarm, and open-country rural farm. The four-way breakdown demonstrates clearly the substantial difference in characteristics between the village population and the open-country nonfarm population. It also confirms the fact that major differentials exist between the farm and nonfarm open-country population, aside from occupation structure. In addition, some special statistics for the village farm population are given.

There is a good discussion of urban influences on the rural population, derived by classifying all counties in the country by metropolitan status and size of largest city. The one strong gradient observed here is that the larger the largest city in a farm resident's home county, the more likely are he and his wife to have their principal employ-

ment in nonfarm work. A detailed exposition is given of socio-economic differences between central cities, suburbs, and fringe areas, utilizing the new concepts of urbanism used in the 1950 Census. Because of the lack of earlier comparable data, there are no time series.

The second half of the book deals with metropolitan areas and urban places classified by type of economic specialty. It begins with a 37-page methodological statement on the functional classification used. In the opinion of the reviewer, this statement is an obstacle to the reader and should have been placed in an appendix, if included at all. This is not to quarrel with the resulting classification, which types every city of more than 10,000 population by its economic specialties and income level.

The literary style of the book is distinctly academic. Partly because of the nature of the material and the purpose of the work, it is difficult to read a large slice at one sitting without strong motivation. This is especially true of the second half, which, by the way, deals much more with purely economic analysis than one might anticipate from the title of the book.

Duncan and Reiss are careful investigators, with high research and reporting standards. But their apparent desire not to take anything for granted sometimes leads to elaboration of the obvious; for example, a paragraph on the fact that residents of college towns have more education than those living in noncollege towns. Conditions in their method of identifying economic specialization almost make it impossible for a manufacturing town to have more than one specialty. Thus their conclusion that "places highly specialized in trade are not very likely to specialize also in manufacturing" becomes a truism.

However, these objections aside, *Social Characteristics of Urban and Rural Communities, 1950* easily passes the ultimate test for this reviewer, namely that he is glad to have his copy and to be able to add it to his reference shelf.

Calvin L. Beale

TENNESSEE VALLEY AUTHORITY in 1955 sponsored a symposium of economists, agronomists, and statisticians to discuss the economic considerations of fertilizer use. This book is based on the papers presented at that time. The 14 papers are grouped under the 5 headings of methodology; design of experiments and models; agronomic considerations; application of data; and use and manufacture of fertilizer.

The first section, which consists of two chapters prepared by Earl O. Heady and Glenn L. Johnson, points out that establishing production functions for crop-response inputs is a complicated scientific job. We do not know a great deal about how fertilizer nutrients substitute, or even whether they are complementary or supplementary. The response surface is further complicated by the varieties of seed use, differences in seedbed preparation, varying dates of planting, and a set of exogenous variables such as climate and disease, which are beyond the farmer's control. This indicates a need for more intricately designed controlled experiments on response to fertilizer.

The next section is a well-organized contribution from North Carolina State College. Each of these three chapters is precise and detailed in its treatment of the development of models and statistical analyses. Chapter 5, by David D. Mason, is particularly interesting to the more casual reader, as it discusses several of the more common functional models that relate to fertilizer response.

The section concerned with agronomic considerations and the fitting of functions to existing data is not a particularly precise unit. The contributions by the two agronomists are varied. John T. Pesek incorporates economics into his chapter while W. L. Parks writes purely in the physical science area. However, this chapter gives a good indication of the complex variations which the research man encounters in dealing with soil-moisture and fertilizer-response problems. Two chapters on assorted methods of analysis follow, one by E. W. Kehrberg, which discusses the possibilities of developing production functions from the wealth of data recorded by soil-

testing laboratories, and one by D. B. Ibach on a graphic method of estimating yield response by using standard yield curves based on the exponential function.

The rewards of research are expounded in the fourth section of the book where practical applications of fertilizer production functions are made. Using a two-variable production function, William B. Brown applies prices to inputs and outputs to determine the most economic level and combination of fertilizers. These results are presented in a form to be used by farmers or extension workers. Woodworth, Swanson, and Heady work over essentially the same theme—adjusting fertilizer use to maximize income. Varying degrees of emphasis are placed on linear programming and other forms of marginal analysis, yet the three chapters are remarkably similar in philosophy and methodology.

The book ends with a straightforward discussion of changes in the fertilizer industry; this is interesting background but it contributes only indirectly to the original objective.

The stated objective of the book is "to present the most recent information and techniques bearing upon some of the important questions involved in studies of the economics of fertilizer use, thus facilitating the development of needed research." The editors point out that many lean research years elapsed between the pioneer work by Mitscherlich and Spillman on fertilizer-response curves and recent developments in the methodology of handling this type of data. They reason that causes for this lag were overspecialization in agricultural research, thereby stifling interfield research, and the dearth of agricultural economists trained in mathematics and statistics.

To comprehend the implications of this volume thoroughly, considerable training in mathematics and statistics is desirable. This need for background presents a problem concerned with the use of the book and its ability to reach a large number of economists and physical scientists. Its principal use will probably be by advanced students in production economics. As its content is pointed largely toward economic problems, its

acceptance by agronomists may be slower. One can only speculate as to the possible number of relatively untrained converts this book may entice

to institute modern methods of statistical analysis in the field of fertilizer economics.

George E. Frick

The Economics of Consumption: Economics of Decision Making in the Household. By Willard W. Cochrane and Carolyn Shaw Bell. McGraw-Hill Book Company, Inc., New York. 1956. 481 pages. \$6.50.

THIS BOOK IS PROPOSED as a text for a course in consumption economics to follow a conventional course in principles of economics, comparable in level to a first course in labor economics, for example. As a starting point, the authors adopt the following definition of consumption economics: "The study of decision making by households with respect to the choice of goods and services used in living, together with the relationships growing out of, and the activities surrounding that decision making."

They propose to broaden the subject from the theory of consumer choice—to which they have found consumption economics mostly limited—by adding the measurement of satisfaction associated with choice patterns, next the formulation and measurement of economic relations that emerge from particular choice patterns. This leads on to a study of the implications of these relations for the rest of the economy. Next comes a study of the structure of wants, then consideration of problems surrounding consumption adjustments, a study of markets and the marketing system, and, finally, the information problem of consumers.

To remind new students of consumption economics of the connection between this area and the principles of economics, the authors review basic concepts of modern economics and of the economic system, as well as the related field of national income accounting.

After developing the "received theory of consumer behavior" from the central problem of choice making to the utility solution and to the indifference solution, the authors stop to appraise its strong and weak points. Then they neatly and succinctly present some of the more recent developments in the theory by such economists as Norris, Katona, and Bilkey. Agricultural economists who are familiar with Cochrane's early study, "High-Level Food Consumption in the United States"¹

written while he was in the former Bureau of Agricultural Economics, will be interested in the authors' argument that minimum standards of consumption can be developed to minimize consumer disutility.

In the section on the expenditure approach to consumer behavior, Cochrane and Bell briefly summarize some of the survey and aggregative data on household and commodity expenditures, consumption, and savings. Some agricultural economists may be surprised at this finding: "The outstanding fact in food consumption is the limitations of the human stomach, which preclude much change in the volume of food consumed by a people." Others, who have more than a passing acquaintance with food and nutrition data, may wonder at the authors' direct comparison of supplies of nutrients in foods as purchased with National Research Council's Recommended Dietary Allowances for ingested nutrients. The comparison is found in table 13-2.

The experience and specialized knowledge of the authors are shown to best advantage in their development of the concept of demand. To round out their presentation of the consumer in the market, Cochrane and Bell supply chapters on business practices and on the influence of Government on consumer incomes and expenditures.

In the last section, which deals with the consumer outside the market, there is an intriguing statement of collective or group consumption. This reviewer wonders why Cochrane and Bell did not view the household as the smallest collective unit of consumers, thus avoiding their apparent difficulty with their basic unit. Despite their definition of consumption economics in terms of the household, they continuously shift back and forth to the terms "consumer" and "consuming unit," contrary to the customary practice of consumption economists. The household would appear to be at one end of the range of collective units, and society at the other.

¹ U. S. Department of Agriculture. Misc. Pub. No. 581. 48 pp. Washington, D. C. December 1945.

This reviewer begrudges the space allocated to some of the topics usually covered in the principles course, such as free competition, oligopoly, monopoly, multiplier theory, and national income accounting, at the expense of such topics as consumer savings, patterns of consumption, quality of goods as well as quantity, marketing services, and factors bringing about changes in tastes and preferences for goods and for services. Just as the ordinary text on labor economics discusses labor

unions, the consumer movement deserves more than bare mention in a book on consumption economics.

As I am not a teacher, I cannot adequately judge the success of the book as a text. But I can recommend it to agricultural economists unfamiliar with consumption economics as a reference work on a subject of growing importance to the analysis of agricultural problems.

Marguerite C. Burk

Economic Analysis. By Edmund Whittaker. John Wiley and Sons, Inc., New York. 1956. 460 pages. \$6.50.

WRITTEN PRINCIPALLY for the undergraduate who has completed a basic course in general economics, this text is a strong entry in a well-entrenched field. The book is designed to introduce students to modern economic theory and economic analysis. It is well organized, and a pleasure to read.

Like a child assured by its mother that a medicine doesn't taste bad, the reader is assured by author and publishers that the book is essentially nonmathematical; *mirabile dictu*, it isn't. Professor Whittaker has avoided the temptation of including rigorous proofs and derivations that add little to the subject matter at the level for which the book is designed, and that, too often, merely become a professional show of muscle. However, with a judicious use of elementary algebra and geometry, the writer leads one gently to peaks that heretofore have been guarded at least by integral signs.

The book is divided into two major sections. An excellent review of principles, and their extension into modern analysis, occupies about the first quarter of the text. The remainder is devoted to integrating micro- and macro-economics and describing current applications of procedures and methods. The experience of Professor Whittaker as an economic historian is a great asset in relating classical ideas to those of the present day. The book is admittedly slanted toward the business and management students, but with some supplemental reading it would be more than adequate for the major or pregraduate school student in general economics. Chapter bibliographies are annotated and references are within the grasp of the student.

In part I, the author places man in relation to the economic world and carefully defines his position, not forgetting noneconomic forces that are constantly interacting upon him. The author reviews basic laws and gives some idea of methodology and source of data. With great skill, he introduces the subject of analysis and briefly discusses some of the major tools of economic research, including 3-variable analysis and production surfaces. Completing the first section is a chapter on planning; this is elementary, but it gives the reader at least some idea of modern decision making.

Part II, a discussion of the entire economy, begins with an interesting exposition of Walras' equilibrium system. The reader is then given some review of the time-honored subjects of wages, consumption, capital, production, price, and income. In the discussion of each, the author assiduously connects the basic laws and principles with current problems and methods of analysis. This was of particular interest to this reviewer who, when using the standard texts of this type, often wondered how empirical research related to theory.

Criticisms of the book are few and minor. The concept of elasticity is relegated to rather a minor role in the chapters on consumption and income distribution. Flow diagrams relating to income add little to the text and graphs. Perhaps some attention could have been given to some facets of sector analysis. All of these could be moot points and should not deter anyone from reading this well-conceived book with its definitely original approach.

William W. Addison

ONE MAY SAY OF THE CONTENTS of this book what my favorite weather forecaster said of a cheering day in midwinter, "variable cloudiness with intervals of sunshine." Because it comes at a time when more light is especially welcome, the cloudiness can be overlooked.

Most of the materials were first presented at a 1954 conference sponsored by the North Central Farm Management Research Committee and aided by the Farm Foundation. The stated purpose of the book is "to stimulate and aid productive thinking and research" in farm productivity and returns to scale.

Broadly interpreted, this purpose has been well achieved within the limitations imposed by the conference approach and by the editorial problems of combining the varied experience and views of 25 authors. These men would probably be the last to claim that they represent a random sample of agricultural economists. In fact, about three-fourths of the book was written by two of the editors, and their close associates and former students. The cohesion of thought therefore derives not from any clustering about the mode of a normal frequency distribution, but from the thrust of a common origin.

Despite some tempering from a few contributions by those with other background, the real differences that do exist with respect to framework assumptions and the use of various types of production functions are hardly perceptible. The only place in which a sharp cleavage develops is in the final section in which Hendrix's searching

discussion of institutional tenure research arouses a vigorous reaction from H. R. Jensen, who closes on an unhappy note of impatience with economists who do not stay close to their technical lasts.

Among the 22 papers and 7 discussion statements, the reader will find Heady's detailed presentation of the technical mechanism for handling production functions and Glenn Johnson's careful examination of problems related to managerial processes well worth reading. The Cobb-Douglas type of function is pursued through many alternative procedures by several of the contributors and compared with other functions.

Russell Olson's review and appraisal of methods used in studying farm size stands out in the section on historical accomplishments. Gerhard Tintner's terse remarks on significance tests in production function research suggest much that is useful. But one wishes that space had permitted expansion of the theme that "tests of significance are not entirely satisfactory from a logical and philosophical point of view."

The technical phases of measurement are emphasized by the approach that prevails in this book. Less is said about underlying assumptions. Here, in fact, is one of the real issues that confront practicing agricultural economists. In solving actual problems, what proportion of research time should be devoted to sharpening tools, and what proportion to locating and developing valid points of departure? Perhaps here is a task for a future conference to continue the work so well begun in this one.

Ronald L. Mighell

Introduction to Statistics. By Frederick C. Mills. Henry Holt and Company, New York. 637 pages. 1956. \$6.00.

COLLEGE UNDERGRADUATES who are now being indoctrinated in statistics are indeed fortunate, and authors of statistical texts are to be congratulated, for the trend today is toward material presented clearly, simply, and interestingly. Professor Mills' text is an example.

As an introductory course in statistics normally is taken at an early stage in academic study, a mathematical background of any consequence cannot be presumed. Always there are some students, too, who shy away from anything resembling a mathematical presentation—logical relationships

in the form of mathematical equations are not for them.

Professor Mills evidently recognizes these problems. In his statement of objectives he sets forth the twofold purpose of his book as, first, "to make the exposition intelligible to the nonmathematical reader—that is, to the reader whose formal mathematical training does not go beyond the elements of algebra and analytic geometry"—and, second, "to give a coherent discussion of statistical methods."

Professor Mills has succeeded in meeting these objectives. His treatment and the manner of presentation of the topics covered have indeed made this "an integrated introduction to the methods of modern statistics."

The reader, whether he is a beginning student or a busy administrator eager to learn some fundamentals of statistics and the role it plays in the everyday world, will find the book enjoyable to read and easy to comprehend. Up-to-date examples from business and agriculture frequently illustrate the discussion. Emphasis is on fundamental ideas—their basic assumptions and their limitations. For some topics technical detail is unavoidable. Wherever possible, the text refers to statistical formulas directly, without proof. But when proofs are relevant, or are thought to be of interest, the author puts them in footnotes, thus maintaining continuity in the textual discussion. A more detailed account of the derivation of the standard error of the mean is outlined in the ap-

pendix. A glossary of symbols prefaces most of the chapters, and generally most of them close with a summary of salient points.

This work is an abridgment of the third edition of the author's book, *Statistical Methods*, published in 1955, and the presentation of subject matter in the two volumes is similar—in fact, almost identical. But this shorter version with its general introduction to the subject is more suitable for a beginning course. Starting with simple concepts such as rectangular coordinates, functional relationships, and logarithms, the discussion continues with a description of procedures in organizing and describing quantitative data. The usual statistical measures of central tendency and dispersion follow. Ideas of induction and deduction, elements of probability, and distributions are developed in a discussion of statistical inference—"the essence of modern statistics," according to Professor Mills. Chapters relating to the problems of estimation and tests of hypothesis follow.

The last half of the book is devoted to correlation and regression, analysis of time series, index numbers, the "t" distribution, and sampling. As part of his discussion of time series, the author compares timeworn conventional methods of determining a measure of cyclical change with those developed by the National Bureau of Economic Research. Whether the detailed explanation of the latter method is warranted in an introductory text is a matter for conjecture.

Hyman Weingarten

An Introduction to British Economic Statistics. By Ely Devons. Cambridge University Press. 1956. 247 pages. \$4.00

SINCE WORLD WAR II, a regular and increasingly comprehensive flow of official British statistics has become available. Professor Devons' guide to these statistics is concise and readable. It covers the fields of population, employment, production, foreign trade, prices, incomes, and national income. We are told what information is available, how and by whom the data are compiled, where they can be found, and how far they can be trusted. Although primarily designed to meet the needs of university students of economics, this book has great value to all who use economic statistics regularly in their work, or who make policy decisions on the basis of statistics appraised for them by others.

This usefulness is not limited to students of the British economy. The discussion of general problems relating to the interpretation of British statistics has universal applicability: Careless use of published data, whether deliberate or through ignorance, is not limited to the other side of the Atlantic.

Confusion arises both from semantics and technique. Many of the terms used in statistics, for instance those relating to income, have a quite different meaning than they do in economic theory. The use of statistics may mislead rather than inform unless one knows what the figures cover, whether definitions have been changed from time to time, and how this affects their use;

whether and to what extent two sets of data are comparable, and what the margin of error is in them. The very efforts of statisticians to make improvements in scope and definition are usually at the cost of comparability with the past, for it is rarely possible to revise earlier figures on the improved basis. These problems are compounded when secondary estimates are based on incomplete or inaccurate material.

Specialists have full knowledge of these things, and United States Government agencies that publish basic statistics are careful to set forth the content and limitations of their data. But, as Professor Devons points out, "statistics and the notes which explain and qualify them are easily parted." Most economists, owing to limitations of time,

funds, and filing space, rely largely on secondary sources.

This book serves as a reminder that, as a minimum, frequent rereading of the explanatory notes to the *Statistical Abstract of the United States* is a necessary exercise for economists. Even more valuable in a limited field is the 70-page 1955 *Historical and Descriptive Supplement to Economic Indicators* prepared for the 84th Congress by the staff of the Joint Committee on the Economic Report and the Office of Statistical Standards, Bureau of the Budget. But we have nothing to match the critical simplicity of Devons' pocket-size work. With the flow of British statistics becoming a near torrent, it is hoped that frequent revisions or supplements will be published.

Doris Detre Rasler

Selected Recent Research Publications in Agricultural Economics Issued by the United States Department of Agriculture and Cooperatively by the State Colleges ¹

BADGER, H. T. THE USE OF FROZEN FOODS BY RESTAURANTS. U. S. Dept. Agr. Mktg. Res. Rept. 144, 32 pp., illus. November 1956.

Restaurants bought a larger share of fruits and vegetables in frozen form than the national average for the same commodities. Report gives the proportion of selected commodities bought in fresh, frozen, and canned forms, by size of establishment, price of meal, and regional location for August and November 1954.

BOTTS, RALPH R., RUSH, JOHN D., and ELLICKSON, JOHN C. FARMERS' MUTUAL FIRE AND WINDSTORM INSURANCE IN THE UNITED STATES. U. S. Dept. Agr. Agr. Inform. Bul. 165, 87 pp., illus. October 1956.

This bulletin summarizes the results of the 1954 "benchmark" survey of the farmers' mutual fire and windstorm insurance companies. Not because of higher insurance rates, but because they carry larger amounts of insurance on buildings and equipment, insurance costs of individual farmers have increased greatly in recent years. This bulletin is the result of an effort to learn more about the operating methods of farm mutuals, and the extent to which they are associated with loss and expense rates, assessment income, and size of safety funds.

¹ Processed reports are indicated as such. All others are printed. Such publications may be obtained from the issuing agencies of the respective States.

BOUMA, J. C., and LUNDQUIST, A. L. METHODS OF INCREASING LABOR PRODUCTIVITY IN MULTISTORY AND SMALL ONE-FLOOR GROCERY WAREHOUSES. U. S. Dept. Agr. Mktg. Res. Rept. 142, 42 pp., illus. November 1956.

Warehouse operators reduced labor costs 19 percent in five small one-floor and four multistory warehouses through improved work methods, use of better materials-handling equipment, improved physical layouts, and more nearly balanced work crews. This report evaluates present methods and develops new labor-saving methods.

BREWSTER, J. M., and MITCHELL, J. A. SIZE OF SOYBEAN OIL MILLS AND RETURNS TO GROWERS. U. S. Dept. Agr. Mktg. Res. Rept. 121, 99 pp., illus. November 1956.

A saving of 7 cents a bushel can be made by crushing soybeans in a mill operating at its capacity of 400 tons a day compared with the cost of crushing in a mill that can process only 50 tons a day. Change in the size of solvent soybean-oil mills under typical operating conditions is related to corresponding change in total cost and total revenue per bushel of beans processed. Report compares the efficiencies of different-size mills.

BRINE, C. L. INSTITUTIONAL MARKET POTENTIAL FOR OILSEED PROTEINS. U. S. Dept. Agr. Mktg. Res. Rept. 151, 21 pp. December 1956.

Soybean meal's low cost and high protein value make it potentially useful in institutions with their steadily rising populations and conservative food money allowances. Supplementing diets with protein-seed meal in these institutions may open up a new, although limited, market, for that product.

BUTLER, CHARLES P. SOME ECONOMIC EFFECTS OF COTTON ACREAGE DIVERSIONS IN THE PIEDMONT AREA OF GEORGIA AND SOUTH CAROLINA, 1953-1955. S. C. Agr. Expt. Sta. Bul. 440, 46 pp., illus. September 1956. (Prod. Econ. Res. Br., ARS, cooperating.)

The acreage of cotton has continued to decline in this area since 1930, only partly because of control programs. It was found that the consequences of the allotment program have been no more severe on croppers than on landowners. About 40 percent of the land diverted from cotton since 1953 was idle in 1955. Needed in the area are more opportunities for nonfarm employment, consolidation of small farms, and incentives to farmers to make fuller use of their resources.

DAVIS, JOE F. USE OF ELECTRICITY ON FARMS. A SUMMARY REPORT OF TEN AREA STUDIES. U. S. Dept. Agr., Agr. Inform. Bul. 161, 38 pp. illus. November 1956.

The 11 studies made in the 10 areas are listed in the preface of this bulletin. In the 3 areas in which dairying and poultry production were the chief farming enterprises, consumption patterns showed similarity during the periods studied. Significant differences were found among some of the areas in the use of electricity because of type of farming, size of farm or disposable income, and competition from other fuels and sources of power. Cost of electricity varied widely among the areas, as did costs of electrical equipment, installations, and wiring. Average consumption of electricity has increased at geometric rates since about 1940.

FENZAU, C. J., AND VAN ARSDALL, R. N. ECONOMIES IN FARM DAIRY BUILDINGS AND EQUIPMENT IN RELATION TO SANITARY QUALITY OF MILK. U. S. Dept. Agr., Agr. Inform. Bul. 153, 59 pp., illus. March 1957.

The studies reported here were conducted over a 3-year period on 15 farms in the St. Louis milkshed. They show that with good sanitation practices, milk of high sanitary quality can be produced with half the labor and half the investment in buildings and equipment commonly found on dairy farms in the area. The study was made under contract with the Doane Agricultural Service, Inc.

HANSEN, PETER L., AND MIGHELL, RONALD L. ECONOMIC CHOICES IN BROILER PRODUCTION. U. S. Dept. Agr. Tech. Bul. 1154, 27 pp., illus. December 1956.

The expansion in production of commercial broilers is one of the outstanding phenomena of recent agricultural history. The most profitable weight for broilers is interrelated with the number of birds per lot and the number of lots per year possible within time, space, and labor limitations. Feed-dealer suppliers appear to be the key business firms in the broiler industry.

HENDRICKSON, C. I., AND DAHL, F. H. RESALES AT MARYLAND TOBACCO AUCTIONS. U. S. Dept. Agr. Mktg. Res. Rept. 148, 27 pp., illus. December 1956.

Profits from the resale of Maryland tobacco are made possible by the large quantity of poorly prepared tobacco coming to the market and by market imperfections—such as speed of sale and variations in light. Information about these looseleaf resale auctions, how farmers could cut down resale margins and decrease speculation at Maryland looseleaf auctions, is contained in this report.

HERRICK, VIRGIL C., AND RAUP, PHILIP M. ORGANIZATIONAL PROBLEMS IN DEVELOPING THE SMALL WATERSHEDS OF MINNESOTA. Minn. Agr. Exp. Sta. Bul. 437, 24 pp. illus. January 1957. (Prod. Econ. Res. Br., ARS, cooperating.)

This bulletin discusses experiences of the first 2 years under the Watershed Protection and Flood Prevention Act, passed by the Congress in 1954 and amended in 1956.

HOCHSTIM, E. S. WOMEN'S ATTITUDES TOWARD WOOL AND OTHER FIBERS. U. S. Dept. Agr. Mktg. Res. Rept. 153, 123 pp. February 1957.

American women prefer wool to any other fiber for spring, fall, and winter suits and separate skirts, according to a survey of 2,500 women. They were questioned about what fibers they used in suits, skirts, and sweaters, what fibers they liked best, and what they liked and disliked about various fibers. This survey was a part of the Department's program to increase consumption of farm products.

HUTCHINS, WELLS, A. THE IDAHO LAW OF WATER RIGHTS. 117 pp. Idaho State Department of Reclamation, Boise, 1956. (Prod. Econ. Res. Br., ARS, cooperating.)

This is part of the revision of "Selected Problems in the Law of Water Rights in the West," which was issued in 1942 as Miscellaneous Publication 418 of the U. S. Department of Agriculture. The completed revision will comprise an overall discussion of water rights law for the 17 Western States.

JACKSON, DONALD, DELOACH, D. B., AND KINZ-HUBER, R. J. MARKETING SUGAR BEETS. U. S. Dept. Agr. AMS-137, 31 pp., illus. November 1956.

Several alternate price bases for sugar beets, other than the ones now in use, were found to be statistically feasible by researchers. Western beet growers have questioned whether the marketing costs for beets might not be lowered if changes in the basis for sharing such costs were made. The contracts and possible alternative methods of pricing beets are studied briefly in this report.

JANSSEN, M. R., AND ROBERTSON, L. S. PROFITABLE ALTERNATIVE SYSTEMS OF FARMING ON A LEVEL CENTRAL INDIANA FARM. Ind. (Purdue) Agr. Expt. Sta. Bul. 636, 24 pp., illus. June 1956. (Prod. Econ. Res. Br. ARS, cooperating.)

This study of a 168-acre level central Indiana farm indicates that the selection of more profitable cropping systems, better fertilization practices, and more desirable livestock combinations and practices can increase labor income from \$2,399 for the present system to \$6,338 for an improved farming system under average management.

JOHNSON, H. D., AND BREAKIRON, P. L. PROTECTING PERISHABLE FOODS DURING TRANSPORTATION BY TRUCK. U. S. Dept. Agr., Agr. Handb. 105, 70 pp., illus. December, 1956.

Transportation of perishable food products in refrigerated trucks and trailers has increased rapidly. Information on how to protect motor-truck shipments of perishable farm products from loss or deterioration in transit is carried in this handbook, with specific requirements for protection for many commodities.

KAHLE, H. S., AND GRAY, L. R. UTILIZATION AND DISPOSAL OF POULTRY BYPRODUCTS AND WASTES. U. S. Dept. Agr. Mktg. Res. Rept. 143, 54 pp., illus. November 1956.

Disposal of about 1.4 billion pounds a year of poultry wastes and byproducts is important to the poultry industry. This waste represents 20 to 30 percent of the live weight of all poultry killed. Potential outlets include farmers and renderers. Researchers suggest a hunt for such outlets before poultry byproducts are discarded.

LIMMER, EZEKIEL, AND BYRNE, R. J. TRANSPORTATION OF RICE IN THE SOUTH—AN ECONOMIC SURVEY. U. S. Dept. Agr. Mktg. Res. Rept. 140, 51 pp., illus. November 1956.

Railroads dominate rice transportation in the South primarily because rail freight rates are lower than trucking charges, especially to distant markets. The railroads carry about three-fourths of the rice handled by mills, driers, and warehouses. Researchers also calculated the cost to shippers of cleaning and reconditioning boxcars for outgoing shipments and suggested economies that might improve the transportation of rice.

MEHL, PAUL. STATE EGG LAWS AND REGULATIONS. U. S. Dept. Agr., Agr. Handb. 112, 44 pp. December 1956.

Forty-seven of the 48 States have laws regulating egg marketing—but egg laws vary greatly from State to State. Report summarizes and compares principal provisions and requirements of the State egg laws and regulations, and attempts to stimulate interest in a greater degree of uniformity among the States in their egg marketing practices.

POATS, F. J. TRANSPORTATION IN MARKETING MOLASSES FOR FEED. U. S. Dept. Agr. Mktg. Res. Rept. 149, 28 pp., illus. January 1957.

Increased use of molasses in livestock feed has been accompanied by increased use of tank trucks to transport it—from railroads, waterborne carriers, and seaport terminals directly to users. Molasses shipments by water up the Mississippi River expanded a hundredfold from 1949 to 1954 as the result of tank-truck deliveries making molasses available in small quantities. Report gives figures and facts on transportation of molasses from 1949 to 1954.

REESE, ROBERT B. SURVEY OF FRUIT AND TREE NUT USE BY FROZEN DESSERT MANUFACTURERS. U. S. Dept. Agr. Mktg. Res. Rept. 146, 32 pp., illus. December 1956.

Based on 1953 consumption figures, some 112 million pounds of fruits and berries in all forms were used that year by the frozen dessert industry in the wholesale manufacture of icecream and related products. The frozen-dessert industry is a major outlet for frozen fruits and nuts, and researchers estimate that future demands for fruits by this industry might rise to 150 million pounds by 1975.

STIPPLER, HENRY H. SPRINKLER IRRIGATION IN THE PACIFIC NORTHWEST. U. S. Dept. Agr. Agr. Inform. Bul. 166, 265 pp., illus. November 1956.

This report provides information on costs of sprinkler irrigation systems as they relate to crops and climate and to design and operation in both the high- and low-rainfall areas of the Pacific Northwest.

TURNER, G. D., AND BRASINGTON, C. F. LIVESTOCK AUCTION MARKETS IN THE SOUTHEAST—METHODS AND FACILITIES. U. S. Dept. Agr. Mktg. Res. Rept. 141, 99 pp., illus. November 1956.

During the last 2 decades the number of livestock auction markets in the Southeast has increased rapidly. This is a study of these markets to provide data and guidelines which can be used in establishing and operating auction market facilities more efficiently.

U. S. AGRICULTURAL MARKETING SERVICE. DO TRADING STAMPS AFFECT FOOD COSTS? U. S. Dept. Agr. Mktg. Res. Rept. 147, 6 pp. January 1957.

The use of trading stamps in food retailing has grown tremendously. This report sets forth the basic characteristics of stamp plans, reviews and discusses available literature, and considers some of the problems of retailers and consumers alike arising from use of these stamps.

U. S. AGRICULTURAL MARKETING SERVICE. FOOD TRANSPORTATION AND WHAT IT COSTS US. U. S. Dept. Agr. Misc. Pub. 738, 23 pp., illus. November 1956.

For every dollar spent in 1955 by consumers for food, 8 cents went for transportation. This report gives a general overall picture of transportation costs and factors involved in food transportation.

U. S. AGRICULTURAL MARKETING SERVICE. FRESH FRUIT AND VEGETABLE PREPACKAGING, NORTHEASTERN REGION. U. S. Dept. Agr. Mktg. Res. Rept. 154, 43 pp. February 1957.

Current trends seem to indicate that prepackaging will be the accepted future method of marketing items of fresh produce which are adapted to packaging. This preliminary survey of fresh-produce packaging plants showed that now only about 30 of the 100 fresh fruits and vegetables marketed are being packed by the plants surveyed. Packing operations for these fruits and vegetables were studied and compared.

U. S. AGRICULTURAL RESEARCH SERVICE. PRODUCTION ECONOMICS RESEARCH BRANCH. EFFECTS OF ACREAGE-ALLOTMENT PROGRAMS, 1954 AND 1955. A SUMMARY REPORT. U. S. Dept. Agr. Production Res. Rept. 3, 18 pp., illus. June 1956.

The acreage-allotment, marketing-quota, and associated price-support programs that were in effect in 1954 and 1955 influenced total farm production very little, although they modified production of specific commodities. From 1953 to 1955, total production of 4 basic allotment crops—cotton, wheat, corn, and rice—was reduced by 8 percent, but the reduction was more than offset by increases in production of nonallotment crops. Major uses of land changed little because of the programs.

WEIDENHAMER, MARGARET. SELECTED HIGHLIGHTS FROM A STUDY OF CONSUMER USE OF AND OPINIONS ABOUT POULTRY. A PRELIMINARY REPORT. U. S. Agr. Mktg. Serv. AMS-159, 11 pp. January 1957.

Over 90 percent of all homemakers interviewed had served broilers or fryers sometime during the year covered by the survey; about half of these users served broiler-fryers once or more a week. Almost all of the users of broiler-fryers had served them fried; about 40 percent baked or roasted them; about 25 percent broiled them; and about 17 percent barbecued them.

WOOTEN, HUGH H., AND ANDERSON, JAMES R. MAJOR USES OF LAND IN THE UNITED STATES. SUMMARY FOR 1954. U. S. Dept. Agr., Agr. Inform. Bul. 168, 102 pp., illus. January 1957.

This is one of a series of publications issued at intervals that show acreages of land used for crops, pastures and grazing, forests and woodlands, and other purposes. This survey was made for the year in which data for the farm census were obtained.

Statistical Compilations

BIERMAN, RUSSELL W., and ELLIOTT, IRMA P. FARM INVESTMENTS OF LIFE INSURANCE COMPANIES—1956. U. S. Agr. Res. Serv. ARS 43-37, 14 pp., illus. October 1956.

GOODSELL, WYLIE D. COST AND RETURNS, COMMERCIAL FAMILY-OPERATED FARMS, BY TYPE AND SIZE, 1930-1951. U. S. Dept. Agr. Statis. Bul. 197, 67 pp., illus. November 1956.

JENNINGS, R. D. ANIMAL UNITS OF LIVESTOCK FED ANNUALLY, 1909 TO 1955. U. S. Dept. Agr. Statis. Bul. 194, 36 pp., illus. October 1956.

U. S. AGRICULTURAL MARKETING SERVICE. CITRUS FRUITS BY STATES, 1949-50-1955-56, REVISED ESTIMATES, PRODUCTION, USE, VALUE. U. S. Dept. Agr. Statis. Bul. 201, 12 pp. January 1957.

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U. S. AGRICULTURAL RESEARCH SERVICE AND U. S. AGRICULTURAL MARKETING SERVICE. FOOD CONSUMPTION OF HOUSEHOLDS IN THE NORTH CENTRAL REGION. U. S. Dept. Agr. Household Food Consumption Survey 1955, Rept. 3, 196 pp., illus. December 1956.

U. S. AGRICULTURAL RESEARCH SERVICE AND U. S. AGRICULTURAL MARKETING SERVICE. FOOD CONSUMPTION OF HOUSEHOLDS IN THE NORTHEAST. U. S. Dept. Agr. Household Food Consumption Survey 1955, Rept. 2, 195 pp., illus. December 1956.

U. S. AGRICULTURAL RESEARCH SERVICE AND U. S. AGRICULTURAL MARKETING SERVICE. FOOD CONSUMPTION OF HOUSEHOLDS IN THE SOUTH. U. S. Dept. Agr. Household Food Consumption Survey 1955, Rept. 4, 196 pp., illus. December 1956.

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U. S. AGRICULTURAL RESEARCH SERVICE AND U. S. AGRICULTURAL MARKETING SERVICE. FOOD CONSUMPTION OF HOUSEHOLDS IN THE UNITED STATES. U. S. Dept. Agr. Household Food Consumption Survey 1955, Rept. 1, 196 pp., illus. December 1956.

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